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MAGAZINE

The latest news & reviews from the industry

# InnoTrans 2018

## The Biggest Rail Show in the World – Even Bigger!


**PLUS**

**Our InnoTrans Index 2018**

*see page 24*

InnoTrans Special – Issue Three 2018

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COBHAM

Did you know that **half** of UK train commuters face poor and unreliable mobile connectivity?

And that **51%** of passengers would rather connect to the internet via their mobile provider rather than use train WiFi?*

Anyone who has had tried to make a call, send an email or watch an online video on a train knows it can be a challenge.

Improving the digital experience of railways is becoming an increasing priority for both rail companies and mobile operators.

Cobham Wireless is a leading provider of railway cellular communications systems with solutions in place with many of the world's leading train operators and mobile network providers.
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Our intelligent digital onboard repeater (idOBR) solution enables train and mobile operators to provide high quality levels of service for cellular coverage, even on trains travelling at speeds of 350km/h.

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Connected – Seamless – Wireless

*UK Survey conducted by YouGov

# Letter from the Editor

Dear Readers, it is upon us once more. InnoTrans, that time every two years when the entire rail industry heads to Berlin for a week's worth of networking, learning, showcasing, socialising and, quite frankly, a lot of walking.

Our opening feature will tell you all about what's in store at this year's InnoTrans, from the Opening Ceremony to careers and presentations.
I personally have picked some of my favourite rolling stock that will be on show at the Outdoor Display – though of course with 3,500 m of track I could but choose a tiny fraction of what we will get to see during the event. Having grown up in North-Rhine Westphalia, Germany, I'm particularly interested in the **Rhine-Ruhr Express**, for which Siemens is supplying the rolling stock – as featured on the front cover – and which will then be operated by Abellio and National Express, who will lease the trains from VRR. In fact, I am sure I'll get the pleasure of riding in one the next time I visit.

**Alstom** made a big splash at InnoTrans 2016 with its presentation of the hydrogen fuel cell-powered Coradia iLint. In this issue we have an article for you about Alstom's project to convert Eversholt Class 321 electric multiple units into hydrogen-powered trains.

**Digitisation** has of course also become a major talking point in the rail industry in recent years and will continue to become an increasingly major focus in my view. Our columnist Keri Allan delved into the subject to get the industry view and feature some of the highlights in the digital arena at this year's InnoTrans.

**Panama City** is set to get its second line to its **metro** system, the first metro in central America, in April/May 2019. The first trainset, an Alstom Metropolis EMU, was recently delivered in June. We have compiled a quick fact file for you to get an overview of this project, which will enhance the lives of both the residents of and visitors to this vibrant city.

All this as well as all the innovative, clever and diverse solutions featured by industry members to inform you about the latest technologies and products available to you. We have compiled an InnoTrans Index which will allow you to see very easily where you will be able to find these suppliers so you can chat with them directly at the show.

Our next issue, due to be published in November 2018, which will be a follow-up on **InnoTrans 2018**, keeping you informed of all the highlights of the week. If you would like to be represented on our website or in our magazine, please contact Andrew Lush at **al@railway-news.com**.

And if it's not too soon to tell you, InnoTrans 2020 will take place 22–25 September. Put it in your diary!

Please enjoy our 3rd issue of 2018!

*Josephine Cordero Sapién, editor-in-chief*

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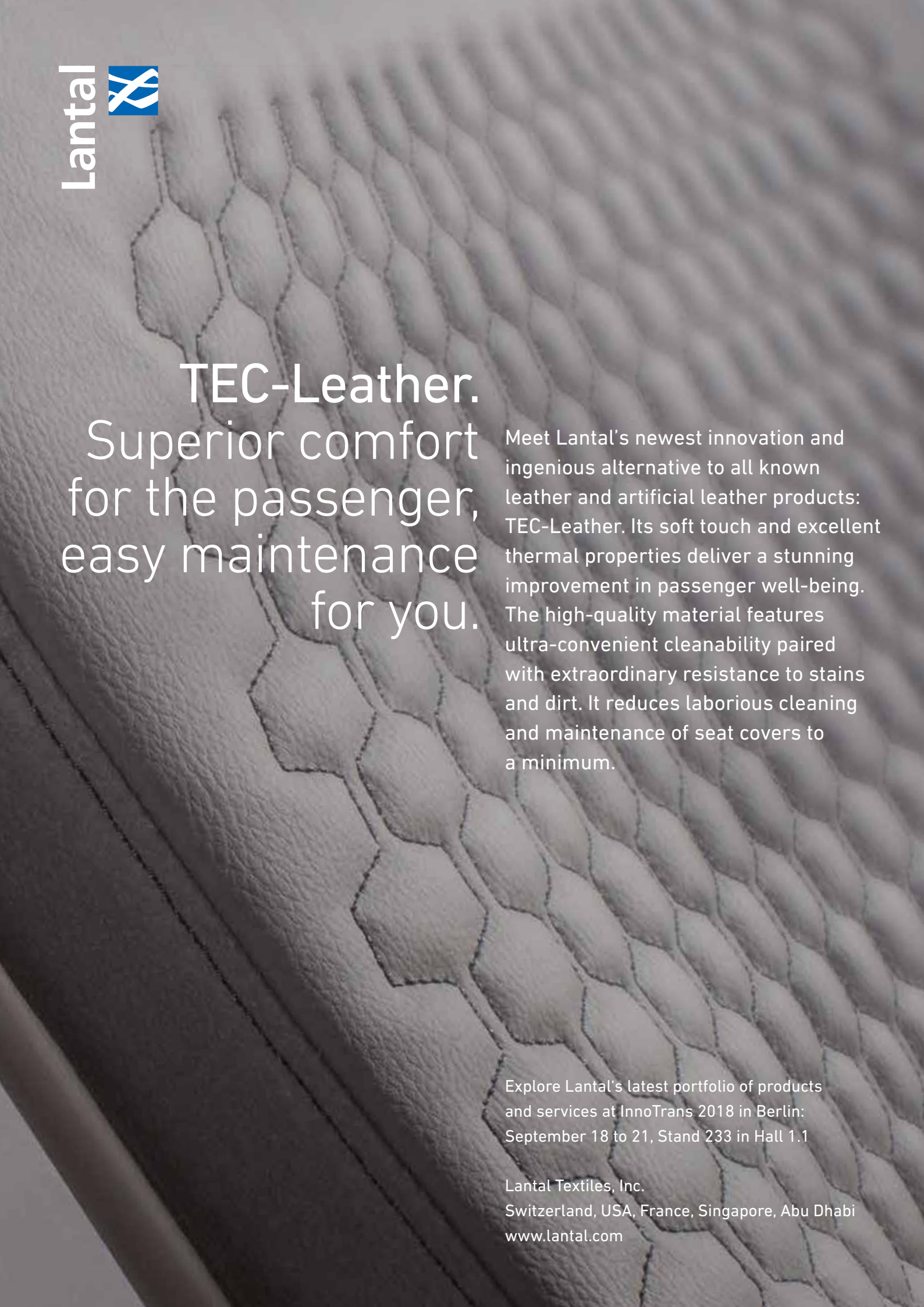
COVER: RRX locomotive manufactured by Siemens (Outdoor Display 2/400) © Sacrety (CC BY-SA 4.0)




# TEC-Leather. Superior comfort for the passenger, easy maintenance for you.

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# Contents



## EDITORIAL FEATURES

# InnoTrans 2018 – The Biggest Rail Show in the World – Even Bigger!

*By Josephine Cordero Sapién*

**Taking place every two years, 2018 will be the twelfth time InnoTrans will fill Berlin's Messe halls with visitors, exhibitors and experts from the rail sector.**

# It's 2018 and it's back! The world's biggest trade fair for the railway sector will take place this month.

InnoTrans


*Skoda's Emil Zátopek Locomotive for DB*

## Some quick facts:

**Dates:** 17 September – press day
18–21 September – InnoTrans open for trade visitors, 9am–6pm
22–23 September – visitor days, only for the Outdoor Display area, 10am–6pm

**Location:** Messe Berlin GmbH
ExpoCnter City
Messedamm 22
14055 Berlin

**2016 stats:** 2,955 exhibitors from 60 countries – almost 200 more than in 2014
137,391 visitors from 119 countries – almost 3,800 more than in 2014
First time InnoTrans features the Bus Display
InnoTrans fills all 41 halls and the Outdoor Display area of Berlin Messe – that's an area of 200,000 square metres
3,500m of track to showcase rolling stock on the Outdoor Display area

**Areas:** Railway Technology
Railway Infrastructure
Public Transport
Interiors
Tunnel Construction

In addition to halls being filled with exhibitors from these five different areas, the Outdoor Display and the Bus Display, InnoTrans 2018 will again feature a Career & Education Hall (7.1c), which will house the Career Pavilion, the Career Forum and the Jobwall

all in one place. Exhibitors are able to feature their company with a stand in this hall or they can request space in the Career Pavilion, where HR experts can focus on recruiting the right employees for them.

The Career Forum is a space featuring seating for approx. 60 attendees. Companies are able to present themselves here as a potential employer. Some of the organisations presenting themselves at the Career Forum include:

- **TÜV SÜD Rail GmbH**
- **Allianz pro Schiene e.V.**
- **IFV Bahntechnik e.V.**
- **Akiem Holding SAS**

## Key events:

**The Opening Ceremony** – InnoTrans 2018 will open with speeches by Dr Christian Göke, CEO, Messe Berlin GmbH, Violeta Bulc, EU Commissioner for Transport, and Andreas Scheuer, Federal Minister of Transport and Digital Infrastructure (Germany). There will also be a panel discussion moderated by Astrid Frohloff on the subject of **'Mobility: Innovative – Multimodal – Sustainable'**.

**Where:** Palais am Funkturm
**When:** 18 September, 10am–11:30am

This panel will feature Jürgen Frenske, President of the Association of German Transport Companies (VDV), Dr Richard Lutz, CEO of Deutsche Bahn AG, Henri Poupart-Lafarge, President of Alstom Transport S.A., Laurent Troger, President of Bombardier Transportation and Michael Peter, CEO of Siemens Mobility GmbH.

Held in the Palais am Funkturm the Opening Ceremony will be attended by more than 1,000 representatives from the fields of business, politics, and science.

**The Official Opening Tour** will take place right after the Opening Ceremony.

**Where:** Palais am Funkturm
**When:** 18 September, noon–2pm

**The Rail Leaders' Summit** will feature the topic **'RAILtropolis – The future of cities is rail'**. This event is organised by Deutsche Bahn and is a platform to address worldwide developments and trends in rail. 2018 will mark the tenth time this event is held. The opening remarks will be made by Andreas Scheuer, Federal Minister of Transport and Digital Infrastructure (Germany). Violeta Bulc, the EU Commissioner for Transport, will give the keynote speech on European policies. The panel will consist of the following guests: Henrik Hololei, Director-General for Mobility and Transport, EU Commission, Chad Edison, Deputy Secretary for Transportation, California State Transportation Agency, United States, Ashwani Lohani, Chairman of the Railway Board, Indian Railways, India, Oleg Belozerov, Chairman of the Executive Board and CEO of the Russian Railways, Russian Federation, Li Wenxin, Vice General Manager of China Railway (CR), Dr Richard Lutz, Chairman of the Management Board and CEO of Deutsche Bahn AG, Germany.

**Where:** Hall 7.3 Berlin Room
**When:** 18 September, 3pm–5pm

With more than 3,000 exhibitors attending this year, 140 rail vehicles on display *(see our 'Rolling Stock Highlights' features Part 1 (p. 39) and Part 2 (p. 85) for more information)* from road/rail vehicles, locomotives, underground trains, container wagons and more, with more than 130 products making their international debut – listed in the InnoTrans Innovation Report – there remains just one thing to be said: enjoy your InnoTrans 2018 and whatever you do, wear comfortable shoes

# Connecting Railways: Why Better Coverage Will Improve Customer Satisfaction

## Trying to use your mobile phone on board a train is notoriously difficult.

Trying to use your mobile phone on board a train is notoriously difficult. Poor, unreliable connectivity has become a frequent part of train travel and has added another item to a growing list of concerns. Depending on the operator, this might include staff strikes, timetable changes, delayed or cancelled services, and the quality of on-board services.

Consistent phone connectivity is an expectation people have today – be it in their own home, at work, in public spaces, and when travelling. And connectivity services are improving. Due to investment in wireless coverage outdoor access to data services has increased. For example, 70% of the UK's geographic area now has a mobile data service from all four operators, up from 63% in June 2017 and 52% in June 2016.

However, improvements do not seem to have benefitted the UK's rail networks, with call reliability on railways – across all four major operators – below the performance achieved on roads and in cities. Other European countries face a similar dilemma. Most railway communications infrastructure was largely developed in the early nineties, designed in the day of early mobile communications. The issue which faces Europe today is that this legacy technology trails a long way behind the current 4G coverage standards. These communications systems need to be improved in order to deliver efficient communications for passengers, rail operators and for emergency services.

### Commuting comms

The impact of poor mobile connectivity on board will be particularly acute for those who commute regularly by train. A YouGov survey found that over half of passengers on the UK's rail networks are prevented from checking emails, staying in touch with clients and colleagues or accessing files remotely, due to poor mobile coverage.

While some rail operators offer on-board Wi-Fi, this service can also be slow and unreliable, and does not meet the expectations and preferences of many rail users. The same survey reported that over half of commuters indicated a strong preference to connecting to the internet via their mobile provider compared to via a public Wi-Fi network.

Cutting down delay times and minimising cancellations will form part of a wider, long-term overhaul of many rail services. Improving on-board connectivity, on the other hand, is something that can be addressed now, with the backing of investment and commitment from rail operators.

The level and quality of cellular coverage on our trains must be brought in line with that in cities. To achieve this, a similar approach to coverage must be taken on railway networks, as in built-up urban areas. How do we cover buildings today? We do it with a dedicated in-building system, meaning trains too should have dedicated technology transmitting signals to passengers.

## Getting on board with cellular coverage

Reliable, high-performance cellular connectivity can be delivered via on-board repeaters and a corridor approach, using multiple low-power radios along the track and a digital DAS (distributed antenna system). This approach is well-suited to underground rail transport networks, as it delivers excellent cellular voice quality, fast internet, and high capacity where the demand is greatest: in stations and on platforms. On a busy, noisy underground train – think the morning and evening rush hours – passengers are less likely to be attempting phone calls and replying to emails.

For above-ground rail networks, strong signals are required within carriages to provide sufficient cellular coverage. Unfortunately, trains offer a less-than-ideal environment for supporting comms, with their metal roofs and multiple windows making signal loss a major challenge. Passengers are not always aware of this, and many will have experienced the frustration of trying to make a phone call after seeing multiple bars of signal on their screen, only for their call to drop or not even connect in the first place.

Digital on-board repeaters help to address this problem, and provide a homogenous signal, equalising the fluctuating signal from outside. The result is an improvement in the signal received inside the train, and consistent signal strengths at reasonable levels. A solution such as this also involves a leakage cable and antenna placed on the roof of the train, rather than the window, where reception is far poorer.

## Happy travellers

The benefits for passengers are clear: uninterrupted connections to the world outside through voice calls, SMS, and data services. According to Ofcom's latest market report, seven in ten commuters use a smartphone during their journey, with the most popular activities being sending and receiving messages and using social media. In addition, more than two-fifths (42%) of commuters agreed with the statement: 'the internet is essential for my commute to complete tasks in my personal life'.

This demand for connectivity is going nowhere, and the 'data tsunami' continues to grow at pace. Connectivity is improving in cities, and transport networks must not be left behind. To meet the demands from passengers, rail operators must be prepared to upgrade their communications infrastructure. A better-quality experience for these passengers – and from mobile operators, who are usually in the firing line – will help boost customer satisfaction levels, which will be invaluable for a transport industry which has received poor press in recent years.

Having on-board coverage infrastructure in place also unlocks further revenue opportunities for rail operators. Reliable cellular overage which guarantees passengers' ability to access the internet would allow operators and third parties to launch dedicated apps with real-time train updates, digital entertainment, click-and-collect on-board dining, and so on. Connectivity could become a competitive differentiator for operators, helping them to attract more passengers. A more enjoyable – and less frustrating! – on-board experience would, in turn, lead to repeat custom, boosting customer loyalty and retention.

***Written by Cobham Wireless.***

*Cobham Wireless delivers state-of-the-art resilient wireless coverage and capacity solutions to enable safer connected cities*

# Railways are Changing

## The transformation of transit and the passenger experience

By Kyle Connor, Global Transportation Industry Principal, Cisco Systems, Inc.

In today's ever changing world, people are constantly online and always connected. This on-going connectivity changes our daily lives and has a major influence on how we view the world of tomorrow. Trends such as demographic change, globalisation, and urbanisation can no longer be understood without considering technical advances. Even our basic understanding of personal mobility and transportation play a part in this trend, since autonomous driving and the increasing digitisation of rail transport are expressions of this development. Innovations in the area of mobility are now no longer conceivable without digitisation.

What does digitisation actually mean? In short, connecting the previously unconnected. In transportation, operators are seeking better uses of assets like rail carriages and tracks, while creating safer and more engaging passenger experiences.

The pre-requisites to these services are secure communication infrastructures with a large bandwidth. Intelligent sensors, miniaturised computers and machines are securely networked in order to develop new findings, competitive advantages and business models with the help of the data generated.

### New Customer Demands Require Action

There is a shifting mind-set today as well, as people expect the information they need to be available at all times. Whether it is a case of finding the best restaurant or simply knowing where friends are, people expect access to data when they need it. These expectations also apply when it comes to mobility: necessary information regarding a route or mobility choices in the area should be at their fingertips. Users now want you to know their wishes and preferences and to provide them with relevant information in advance.

The design of such digital moments for customers is increasingly becoming a decisive competitive factor within the business-to-consumer sector. This data collection is the only way that progressive companies are able to understand the desires of their customers, adjust offers, and even develop new business models on the basis of acquired knowledge. It also represents a paradigm shift for established companies in all sectors.

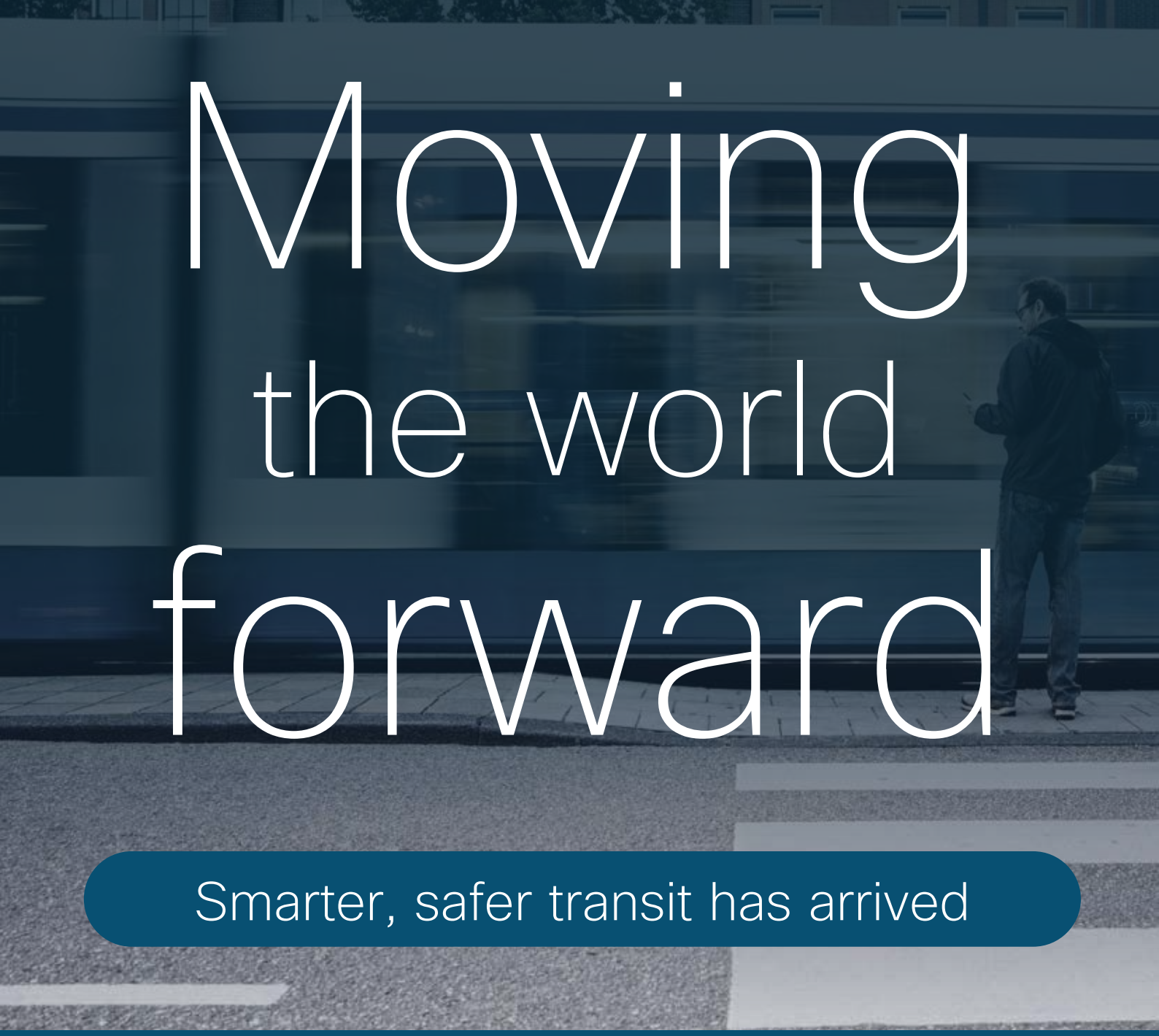
## New Actions Drive New Outcomes

The result of this is that customer contact points increase exponentially. This means that the passenger is a consuming customer not only on the train and in the station, but at any location and at any time. This increase in customer contacts creates a new dimension in customer relations management. Aftersales and presales management become transformed into a continuous customer care process. If a customer wishes to receive a certain service, it is immediately made available to him or her.

This increase in customer proximity also increases knowledge of customer desires. The customer relationship is optimised with every passing second. Highly mobile business travellers rely on efficient time management. If meetings or video conferences can be conducted conveniently and securely (encrypted) in a railway station, stations are thus transformed into office spaces that are available at any location. The station is optimised with regard to visitor requirements, greatly increasing the quality of a traveller's stay. If consumer-oriented added-value services are expanded along with services in the field of security and vandalism prevention, railway stations can become more than mobility hubs. They become attractive centres for work, consumer life, and leisure – in other words, they become living spaces.

Businesses can use their knowledge of the customer to provide him or her with optimal care and assistance. The digital overlay enables businesses to centrally organise and implement the generation and analysis of data regarding customer wishes and preferences. And this agility and quick implementation of new business models are among the most important competitive advantages in the hyper-networked era of the IoT.

Rail and transit will continue to be placed under more pressure as it competes with other means of mobility, and as a result, it must become much more customer-friendly. New thinking and new action – possible through digitisation – will help the 150-year-old railway system move forward and evolve into a more attractive means of transport, even in the postmodern era.




# Cisco Connected Transportation

Bringing real-time decisions
to rail and mass transit

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cisco


# Digitisation is impacting every area of the rail industry,

## from train maintenance through to ticket sales.

*By Keri Allan*

As the industry looks at ways to make the sector 'smart', digitisation is helping streamline activities, lower costs, connect systems and enhance customer experience.

*"We see that digitalisation helps us improve our performance – quality, time, cost – but also opens new business opportunities,"* points out François Deschamps, Head of Global Digitalisation Technology, Bombardier Transportation. *"All areas or functions of the business are impacted. It could be better management of suppliers via a blockchain approach, improved forecast of maintenance tasks via artificial intelligence or production increase on the shopfloor by applying Industry 4.0 concepts."*

*"The digitisation of rail is the biggest opportunity that exists in the industry today,"* continues Laurie Tolson, Chief Digital Officer at GE Transportation. *"As rail operators navigate a dynamic environment, it's critical to find ways to improve efficiency and customer service levels to better compete against other modes of transportation.*

*"Digital solutions deliver on those imperatives and the results speak for themselves – just a one percent improvement in efficiency across fuel use, asset utilisation, car dwell and network velocity adds up to nearly US$6bn in savings per year across the industry,"* she notes.

GE Transportation provides digital solutions to many areas across the industry, from train performance to transportation logistics. With applications in asset performance, train handling, network optimisation and supply chain visibility, it's seen digital solutions deliver results such as a 10–25 percent reduction in mainline failures, an average of 10 percent in fuel savings, a 10 percent improvement in network velocity and a 40 percent increase in rail volume.

*"For example, our smart, automated cruise control system Trip Optimizer saves around one million gallons of fuel per week,"* Tolson notes.

Another example comes from Siemens. Its Mindsphere platform is a cloud-based, open Internet of Things (IoT) operating system, which powers several of its digital solutions including Railigent. This allows operators to manage transportation assets more effectively, utilising sensors to anticipate issues before they occur.

*"For instance, if a train door is*

*closing slightly slower than the rest, operators can bring that vehicle in to have the issue corrected before it causes a delay,"* explains Gerhard Greiter, Head of Mainline Rail Automation at Siemens. *"This technology decreases downtime by 30–50 percent and lowers maintenance costs and energy consumption by 10–15 percent."*

In addition to the operational benefits, Tolson believes that digitisation has fostered culture change that is helping to transform the rail industry. As operators embrace digital tools to tap into previously unused data and leverage new technologies to monitor and respond to dynamic conditions in real-time, they are learning to appreciate the power of information sharing and collaboration.

*"In short, it's changing how people work – from reactive to proactive, empowering workers with new capabilities that are transforming the delivery of freight. As organisations extend that mind-set to their supply chain partners, the entire industry can benefit with enhanced visibility for better planning and optimisation,"* she says.

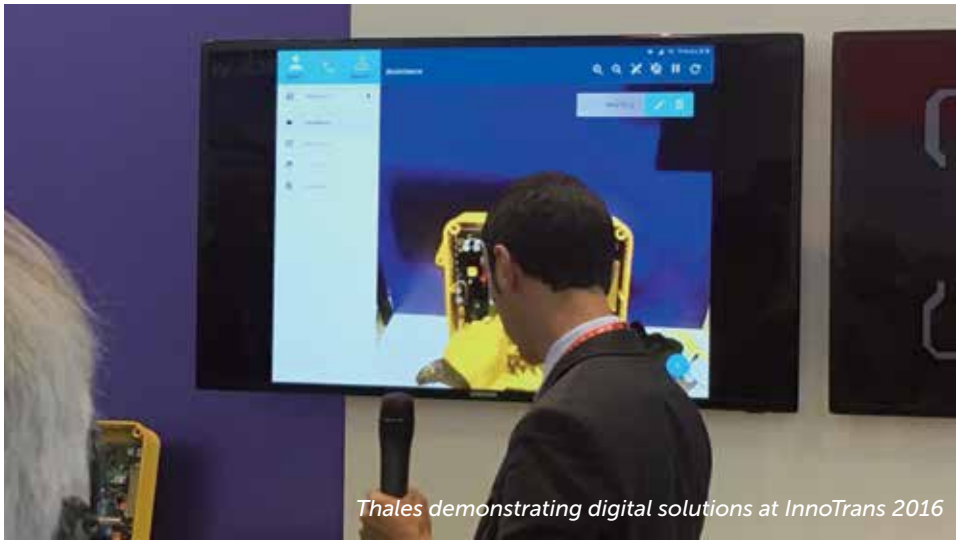
Although many rail suppliers enthuse over the benefits of digitisation, there are those that are unconvinced its potential is being fulfilled.

*"I don't think it has changed the industry in a meaningful way so far other than the industry recognising it needs to focus on it more. It's changed certain organisations and how they operate, but on an industry level, more needs to be done,"* notes River Tamoor Baig, Chief Executive and Founder of Hack Partners.

*"Certainly replacing outmoded mechanical and analogue systems seems worthwhile, but are we really seeing the benefits in terms of reduced cost and greater reliability? Too many applications appear to be vulnerable to failure and may not be as resilient as claimed – and in the harsh operating environment of the railway, resilience is essential,"* continues Phil Mortimer, Project Director for TruckTrain Industries and Innovative Transport Technologies (IT2).

*"Nor am I convinced that the proliferation of systems has reduced the industry cost base or moved productivity to levels that would make an impact in real head-to-head competition with road freight,"* he adds.


*GE Transportation GoLINC digital solution*



Thales demonstrating digital solutions at InnoTrans 2016

*"Digitisation is vital – but as we've seen with initiatives such as the European Railway Traffic Management System (ERTMS), there's more than an element of 'emperor's new clothes' in the promises being made."*

But whatever your view on the current impact of digitisation on the rail industry, you cannot deny the fact that suppliers are working hard to offer new technical solutions.

Bombardier Transportation, for example, recently created a global digitisation group and last year collaborated with Deutsche Bahn, Siemens and SBB to create the Beyond1435 platform, designed to foster innovation around mobility and logistics.

All the main players have grand ideas of how the future 'digital' rail industry will look.

*"In the near future factories will be Industry 4.0 standard and transactions between train authorities, car builders and suppliers will be managed automatically via blockchain," says Deschamps. "Maintenance workers will be empowered by digital solutions such as augmented reality, exoskeletons and training tools will be enhanced with virtual reality.*

*"The industry will continue to see digitisation further extend into the rail infrastructure,"* adds Greiter. *"Cloud-based interlockings allow for a decentralised, intelligent, connected network, where signals and points can be controlled from much greater distances. The Norwegian Railway will become a fully connected network with cloud-based interlockings by 2034, with the first line completed in 2022.*

*"We'll also further see the transformation of train stations. Digital station managers will be able to connect railway stations with passengers through cloud-based control software. Through this portal station status and security and passenger information will allow passengers not only to receive an improved passenger experience, but also play a role in enhancing station operations,"* he concludes.

## Digital innovations to look out for at InnoTrans 2018

**Here's a glimpse of just some of the technologies being showcased at this year's event...**

- Bombardier's virtual reality exhibit takes visitors on a 360° experience of the INNOVIA monorail in Bangkok, a FLEXITY tram in Zurich and a MOVIA metro in Stockholm, highlighting the advantages of a complete mobility solution including options for signalling, operations and maintenance and components.

- GE Transportation will be presenting EdgeLINC, a comprehensive edge device life-cycle management platform providing Industrial Internet of Things (IIoT) connectivity and data flow management, device management, and streaming analytics at the edge and the back office.

- Hack Partners will be launching its HackTrain InnoTrans hackathon, where 80 innovators will be creating prototypes solving some of the industry's biggest challenges.

- Siemens will be highlighting a variety of its technologies including the Velaro Novo high-speed train, Railigent, cloud-based interlockings, the Digital Station and cybersecurity solutions.

- Deutsche Bahn will be presenting its 'ideas train', which showcases what rail interiors of the future could look like, such as a digital fitness coach.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# Rail Renaissance: Are You Ready?

## Delivering solutions for traction power, signalling, buildings and on-board rolling stock systems, Socomec provides electrical power solutions for all rail facility applications.

High performance UPS solution
***MASTERYS GP4***
from 60 to 160 kVA / kW

Our railways are undergoing a period of renaissance, with arguably the most significant investment taking place since the 1950s. This on-going investment – particularly in technology – will enable rail to remain an attractive mass transportation option, as well as being commercially compelling in terms of the movement of goods.

The guaranteed performance of systems within any hard-working rail infrastructure has never been more important. The most advanced low-voltage electrical solutions for rail-specific system architectures guarantee network safety and robustness – even in the most challenging operating environments.

Colin Dean, Managing Director, Socomec comments, "Whether planning a new installation or retrospectively upgrading an existing facility, Socomec can develop a low-voltage electrical solution for an organisation's precise requirements – delivering optimised system performance and robustness, ensuring that these precise requirements are met with a customised solution."

Socomec delivers solutions for traction power, signalling, buildings and on-board rolling stock systems. Socomec provides electrical power solutions for all rail facility applications.

### High-performance Critical Power – PADs Approved

Socomec's Network Rail PADs approved IP+ RAIL range provides the very latest UPS technology for the mass transportation sector. Housed in a compact, robust, steel-framed enclosure, the system has IP31 or IP52 ingress protection as well as anti-corrosion tropicalised circuit boards where required: this system can operate where conductive dust or dripping water may be present.

The electromagnetic disturbance immunity level is double that required by European EMC standards and has been independently tested and certified to pass EN 50121-4 and 5. Furthermore, low-smoke, zero-halogen cables are fitted as standard.

### Easy, Fully-assured and Time-saving Integration

As with many investments, however, a successful operation and attractive ROI ultimately depend upon the optimised performance and flexibility of the system architecture.

### Rack-mounted Modular UPS – for Easy, Fully-assured and Time-saving Integration

Socomec's Modulys RM GP is a 3-phase modular UPS system designed for 19" rack integration across multiple applications. Easy to integrate and install whilst simple to manage and maintain, it provides maximum availability and power protection in a compact design –

leaving space for other rack-mounted devices.

## MODULYS GP – Modular UPS from 25 to 600 kW

The power output by a single MODULYS GP unit can be scaled up from 25 to 200 kW via the addition of power modules that are stacked vertically within a single cabinet frame.

The vertical modular system can be extended further horizontally up to three cabinets in parallel to reach a total output power of 600 kW. Designed with no single point of failure, this solution provides total redundancy of N+1 or N+2.

## Masterys GP4: Performance Accessible to All

Every electrical infrastructure has its own specific set of requirements – which is why the Masterys GP4 range can be customised accordingly. The latest Masterys GP4 and BC+ have been designed to be easily configured – even during order processing – and they can also be adapted to the needs of existing installations.

Building from a catalogue base, with optional building bricks such as a Neutral Kit, IP21, Top Cabling, Top Ventilation, it is possible to create a fully personalised solution with a short lead-time.

## Energy Monitoring: Take Control of Costs – And Improve Efficiency

Providing control over energy costs whilst improving both energy quality and efficiency is vital for the unique demands of the rail sector. The most advanced monitoring, measurement and management systems – such as Socomec's Digiware – provide that control over your energy costs.

A fully digital, multi-circuit plug-and-play measurement concept, with a common display for multi-circuit systems, Digiware is compact and quick to install, and provides the industry's most accurate and effective metering, measurement and monitoring of electrical energy quality. Infinitely scalable, it is capable of monitoring thousands of connection points.

Socomec's Diris Digiware system offers an accuracy of class 0.5 to IEC61557-12 from 2% to 120% of the current sensor primary rating.

## Rolling stock – Keep on Moving

The protection of on-board equipment and systems is fundamental to the safety and smooth operation of any rail operation.

Socomec's innovative automatic transfer switches enhance power availability and simplify the electrical architecture, ensuring standby and alternate power availability.

With on-going investment in development, the Socomec ATyS has been approved for use by LUL (London Underground Limited) as an integral part of a complete system. Certain conditions apply. Please see LUL "Product Registration Certificate 3067" for full details.

Fully certified to BS EN 60947-6-1, ATyS also meets the requirements of BS EN 9999:2008 and BS 8519:2010 when enclosed by Socomec.

## Maintain Service Standards During Infrastructure Improvements

Delivering innovation to the rail industry also requires on-going support to ensure that the installed systems continue to operate at optimum performance levels – particularly when infrastructure is undergoing improvements.

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# InnoTrans Index

| Contributor | InnoTrans | Page |
|---|---|---|
| **3M** | Hall 8.2 / 227 | p.127 |
| **Amantys Power Electronics Ltd.** | Hall 15.1 / 213 | p.99 |
| **Amest s.r.o.** | Hall 20 / 407 | p.113 |
| **Artesyn Embedded Technologies** | Hall 6.1 / 221 | p.82 |
| **Baultar** | Hall 5.1 / 215 | p.133 |
| **British Steel** | Hall 21 / 208 | p.27 |
| **CAF** | Hall 4.2 / 104 | p.23 |
| **Cisco Systems Inc.** | Hall 7.1b / 206 | p.14 |
| **CML Innovative Technologies Ltd.** | Hall 3.1 / 232 | p.86 |
| **Cobham Wireless** | Hall 6.1 / 107 | p.12 |
| **Daktronics** | Hall 7.1a / 105 | p.116 |
| **DAMM Cellular Systems A/S** | Hall 6.1 / 217 | p.106 |
| **ELeather** | Hall 1.1 / 206 | p.34 |
| **ENSCO Inc.** | Hall 25 / 318 | p.71 |
| **ESCHA GmbH & Co. KG** | Hall 10.1 / 212 | p.123 |
| **Frauscher Sensortechnik GmbH** | Hall 25 / 232 | p.67 |
| **GLUETEC GROUP** | Hall 8.1 / 115 | p.145 |
| **Goldschmidt Thermit Group** | Hall 25 / 325<br>Outdoor Display O / 222 | p.152 |
| **Lantal Textiles AG** | Hall 1.1 / 233 | p.4 |
| **Loram Maintenance of Way, Inc.** | Hall 22 / 310 | p.97 |
| **Mechan Limited** | Hall 2.2 / 206 | p.56 |
| **MTM Power** | Hall 17 / 207 | p.47 |
| **Nanov Display, Inc.** | Hall 9 / 616 | p.76 |
| **Parker Hannifin** | Hall 10.2 / 206 | p.117 |
| **Plasser & Theurer** | Hall 26 / 222<br>Outdoor Display O / 530a<br>Outdoor Display 3 / 407 | p.60 |
| **Polarteknik Oy** | Hall 3.1 / 412 | p.130 |
| **Powernet Oy** | Hall 17 / 113 | p.112 |
| **PowerRail Inc.** | Hall 18 / 111 | p.64 |
| **PROSE** | Hall 2.2 / 207 | p.94 |
| **SENSIT s.r.o.** | Hall 6.2 / 105 | p.136 |
| **SKF** | Hall 22 / 611 | p.142 |
| **Socomec** | Hall 11.2 / 210 | p.21 |
| **Stäubli Electrical Connectors GmbH** | Hall 12 / 208 | p.139 |
| **Treadmaster Flooring – Tiflex Ltd.** | Hall 3.1 / 508 | p.150 |
| **Times Microwave Systems Inc.** | Hall 12 / 307 | p.111 |
| **Windhoff Bahn- und Anlagentechnik GmbH** | Outdoor Display O / 421<br>Outdoor Display 1 / 410<br>Outdoor Display 1 / 412 | p.121 |
| **Zetica Rail** | Hall 23 / 209 | p.102 |

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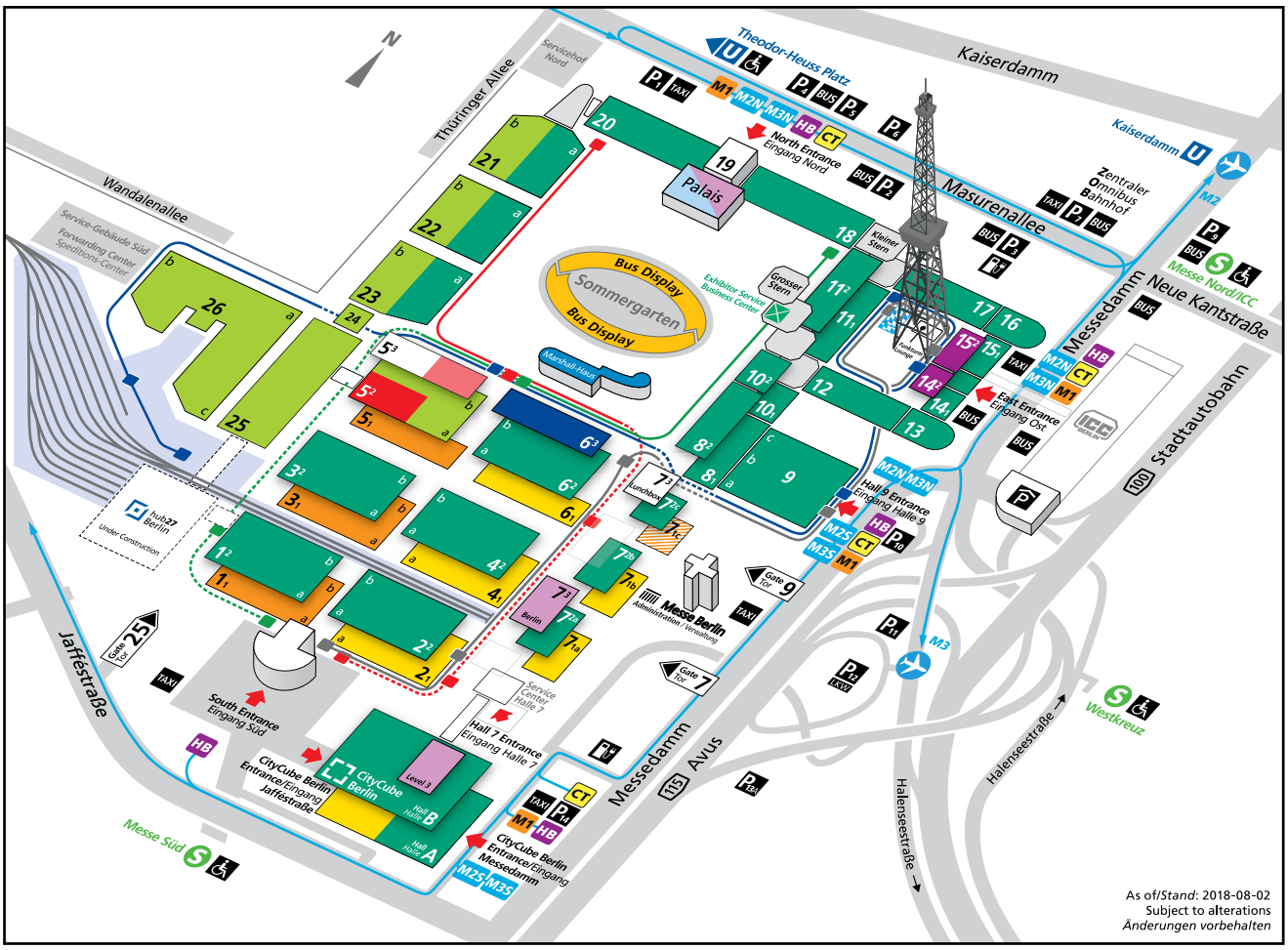
## InnoTrans 2018
18 – 21 September · Berlin




- Railway Technology
- Interiors incl. Travel Catering & Comfort Services
- Railway Infrastructure
- Tunnel Construction
- Public Transport
- Outdoor Display Gleis- und Freigelände
- Bus Display
- Opening Ceremony Eröffnungsveranstaltung
- InnoTrans Convention
- Speakers' Corner
- Career & Education Hall incl. Career Forum
- Business Lounge (Marshall-Haus)
- Press Center Pressezentrum
- Restaurant „Meet'n'Eat“
- Restaurant „Oktoberfestzelt“

**Shuttle Lines** · Shuttle Linien

- M1 Olympischer Platz P+R
- M2N **Airport Tegel – Expo North** Flughafen Tegel – Expo Nord
- M2S **Airport Tegel – Expo South** Flughafen Tegel – Expo Süd
- M3N **Airport Schönefeld – Expo North** Flughafen Schönefeld – Expo Nord
- M3S **Airport Schönefeld – Expo South** Flughafen Schönefeld – Expo Süd
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- **Fast Shuttle South Entrance – Hall 18** Eingang Süd – Halle 18
- **South Entrance – Hall 20** Eingang Süd – Halle 20
- **South Entrance – East Entrance** Eingang Süd – Eingang Ost
- **East Entrance – Outdoor display** Eingang Ost – Freigelände

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BUILDING STRONGER RAILWAYS

# British Steel – Removing Some of the Headaches of Rail Management


Most rail engineers are tasked with the evermore complicated task of managing their assets cost-effectively with ever-increasing traffic and ever-decreasing maintenance windows.

*Stress-Free (SF) heat-treated rail not only delivers high levels of wear resistance but also has added fatigue resistance*

Eking the most from rails is one part of this complex task.

British Steel is delivering some innovative rail types to help extend life and minimise maintenance. These tools for the rail engineer's toolbox help to deliver sustainable, safe and successful rail networks.

Let's have a look at a few:

## Stress-Free rail

British Steel has been heat-treating rail since the early 1980s. With our extensive experience and having delivered well over a million tonnes of heat-treated rails worldwide, we have worked to refine our heat-treatment processes. The latest refinement sees the creation of long-length Stress-Free (SF) rails. The residual foot stress contained in these rails is unbeatably low – often five times lower than competitor rails. So what does this mean and why is it important? Aside from the conventional benefits of heat-treated rail, the uniquely low residual stress in our SF rail gives a huge improvement in foot fatigue performance. A defect in the rail foot needs to be three times larger to initiate a fatigue crack in SF rail than conventionally heat-treated rail.

In some major rail networks, over 50% of rail failures originate from the rail foot. The rail foot is the area most difficult to inspect and so foot fatigue failures are difficult to manage. As the rail head is being managed more effectively and rail lives are maximised, this foot failure mechanism is sure to grow in importance. Using SF heat-treated rail helps protect against this difficult-to-manage failure type and so it helps reduce the stress level of the rail engineer too.

*Being virtually impossible to inspect, this defect propagated to failure from a small corrosion pit without being detected*

## Zinoco® corrosion-protected rail

Steel is an exceptionally versatile material. However, one property it has can sometimes be quite a problem – it rusts. Railway tracks in general rust slowly, but in some locations corrosion occurs much, much faster and can limit the useful safe life of the rail significantly. This rail was removed after just 3 months!

*Hidden under a mainline road crossing, this rail corroded extensively and rapidly*

This troublesome track can be found in wet tunnels, at road/rail crossings, along coastal routes and in other areas where the rail is frequently wet and/or contaminated. These areas are often where rails are most difficult to inspect. It is for these problem locations that Zinoco was created. Zinoco is a durable corrosion-resistant rail which combats rust in these rot hotspots to increase rail life. Delivering a typical 3–10x corrosion life increase compared to unprotected rails, this innovative award-winning product provides protection in some of the most aggressive rail environments. If the foot of the rail is being consumed long before the rail head is worn out, then Zinoco can help extend rail life and stop rail rot.

Unlike traditional paint coatings, Zinoco is universal in application being suitable for 3rd and 4th rail environments as it is also tolerant of stray currents. In contrast, insulating paint and polymer coatings are prohibited by some networks as they can actually make the corrosion problem worse compared to when unprotected rails are used. Zinoco provides both barrier and sacrificial corrosion protection which is damage-tolerant,

*Long length Zinoco rails awaiting installation in Patchway tunnel, UK*

providing real-life rail protection. To find out how track can be protected visit **www.britishsteel.co.uk/zinoco**.

## Multi-Life grooved rail

Urban tramways are often characterised by their twists and turns around our urban streets. These tight curvatures provide challenges to rail and vehicle engineers alike. The urban environment, tight curvature and often zero cant mean that side wear of the rails in tight curves is often severe. Due to the rail being embedded within the road, surface replacement is also extremely costly. Two general schools of thought exist to deliver improved rail life under these conditions:

The first strategy is to improve the wear-resistance of the rail. The more wear-resistant it is, the more traffic the rail can withstand until the wear limit is reached.

The second strategy is to use weld-restoration on these curves – essentially replacing the worn gauge corner with weld metal to extend the rail life. This is known as 'gauge corner restoration' welding. Typically conventional thinking has favoured softer and less wear-resistant grades in order to improve the weldability of the rail in situ.

Multi-Life (ML) rail by British Steel offers the best combination of both these options. This family of grooved rails offers improved in-track weldability over traditional grades, giving the rails multiple lives in service – hence the name Multi-Life. The hardest grade (ML330) not only offers high levels of wear-resistance (comparable to the hardest heat-treated grades), but can also be weld-repaired in-track. The unique combination of a wear-resistant **and** weld-restorable grooved rail has proven popular with some tramway networks who have swapped all their rail replacements to the ML330 grade.
We've created all of these unique rail products in conjunction with rail network operators to help them run more efficiently, sustainably and of course safely. You can find out more about these and other rail products and services by visiting our rail team at **InnoTrans – Hall 21, Stand 208**.

Working together with our partners, we are Building Stronger Railways.

For more information,
please contact **daniel.pyke@britishsteel.co.uk**

*In-track weld repair is a key part of Multi-Life grooved rail's unique benefits*

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# Innovation for a New Era in Connectivity

## We are entering a new era in mobility and communications which is both exciting and challenging, but which has the potential to take connectivity to a whole new level.

These changes have been brought about by the rising need for ubiquitous mobile communications, often at broadband speeds. The smartphone, and other mobile devices, have completely transformed the way and "the where" in which we communicate, work and entertain ourselves. We are 'always on', always contactable. Our expectations of connectivity have completely changed. We want to use devices everywhere – on a train, on an aircraft, whilst at sea.

For the rail industry in particular, the ability to offer ubiquitous broadband access to passengers is a differentiating factor and reliable broadband connections on board puts any passenger rail company at an advantage over competitors and unconnected transport alternatives. Additionally, this capability is essential for rail operations, supporting applications such as scheduling, track condition monitoring, logistics updates, crew communications, security, and telematics that monitor the train performance and health of systems on board.

However, making this happen is extremely complex and has prompted a revolution within the satellite communications (SATCOM) industry which is the definitive provider of "connectivity everywhere". Where GEO satellites were previously the staple for global-reach communications, our need for data and for broadband connectivity is giving rise to the development of High Throughput Satellites (HTS) and also constellations of much smaller satellites in Low Earth Orbits (LEO) and Medium Earth Orbits (MEO). These are all dramatically reducing latency and cost. This is new territory for the satellite communications sector and it's pushing the development of next-generation access technology and antennas in order to deliver these new capabilities.

Washington DC and London-based Phasor is a developer of commercial phased array antenna systems, designed to meet the growing wideband mobile broadband market requirements. The company has been working on its system for over five years and is preparing to introduce it to the market in the near future. The development of the Phasor electronically steered antenna (ESA) has been a study in making the complex simple, and targeting a specific user community – commercial and enterprise mobile broadband market requirements. The team has been tightly focused on the main challenges of enterprise-grade, end-to-end system performance, bringing together a wide range of technical and design disciplines.

Phasor has taken the traditional parabolic SATCOM antenna and transformed it into a flat, solid-state, electronically steerable antenna system, standing just two inches high in comparison with its bulky predecessor. It can be either completely flat or conformal to a vehicle – due to its modular design – including an aircraft fuselage, a cruise ship or a high-speed train, providing enterprise-grade mobile connectivity to passengers and crews alike. The same technology is very well suited to support three different satellite constellation architectures – traditional Geosynchronous Fixed Satellite networks (FSS), High Throughput Satellites (HTS), and Non-Geosynchronous satellite networks (NGSOs). Moreover, the antenna's modular architecture allows the system to be scaled to virtually any use-case requirement, fixed or mobile. It is the ultimate in flexibility, yet it delivers consistently high data rates that support the demanding, bandwidth-hungry applications that are so important today.

## How does it work?

Phasor's system allows users to communicate with satellites anywhere in the sky while on the move using a low-profile, solid-state, electronically steered antenna. Phased arrays are active antennas made up of an interconnected series of very small patch antennas, combined in such a way as to extract a specific satellite signal from a noisy background. By controlling in sympathy the signal delay (or phase) and power levels of each of these tiny antennas, the combined signal can be steered in any direction.

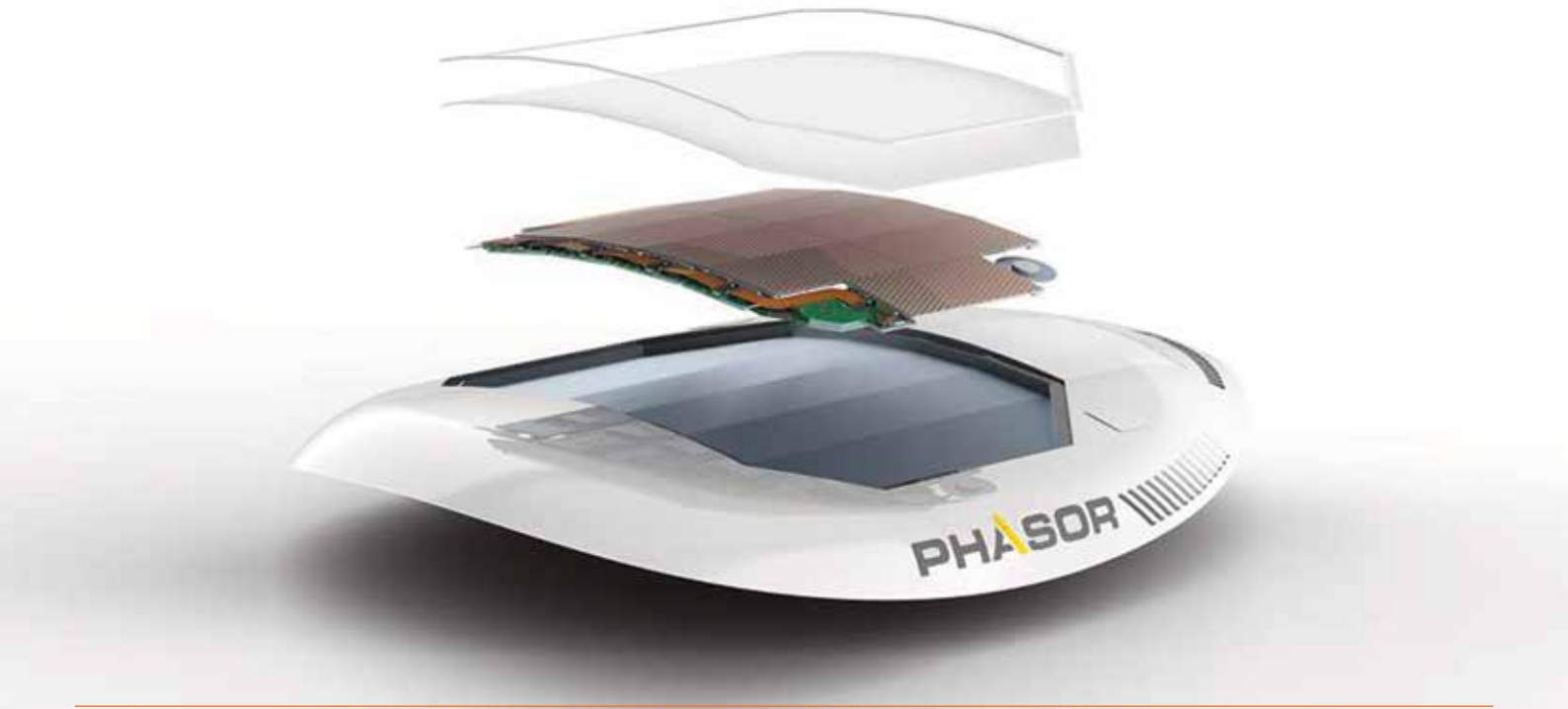
Phasor's system is unique – its proprietary microchips (or ASIC) control each of these tiny patch antennas, and its unique system architecture more efficiently and effectively combines signals to maximise gain. This enables it to create a dynamic, software-controlled antenna that can quickly and robustly track any satellite through a closed-loop feedback algorithm.

## How is it manufactured?

Phasor's antennas are made up from a number of standard PCB assemblies. That means that Phasor is able to leverage the industry standard PCB fabrication and assembly lines that are used for mobile phones, IT or cellular base-station equipment, for example. Therefore production can be ramped up very easily to scale (through manufacturing partners), enabling production of the antennas in a matter of weeks.

## How does the antenna track two satellites at a time?

Phasor's architecture allows for two independent "circuits" that use the same RF aperture area (through the same dual-channel ASICs). The control systems are then able to independently steer these two beams in different directions. These beams are fully independent in frequency, polarisation and pointing angle



and can be fed to the same or separate modems.

This flexibility allows for a whole host of unique benefits, be it interoperability with GEO/MEO/LEO or make-before-break on HTS or LEO constellations.

## How does the system deliver consistently high data rates?

The final delivered data-rates are determined by a number of factors and the antenna is in control of an important but finite number of these. Phasor is very efficient in processing and combining satellite RF signals, which gives it very high fidelity in pointing and tracking accuracy, and very high gain (throughput) capability.

Beyond the ESA electronics, a fundamental driver of data-rate is the effective size of the antenna aperture – it is pure physics that a larger antenna area can deliver proportionally more data. Phasor's scalable modular technology allows it to create a range of different sizes, and uniquely, many modules can be tiled together to create some of the largest flat panel antennas in the industry.

The other important role of the antenna is to robustly track the satellite no matter where or how fast the mounted vehicle (or the satellite itself) moves. This consistent tracking results in a reliable data connection. Phasor is able to do this near-instantaneously due to its closed-loop feedback and fully electronic steering (therefore no inertia). It does not have to rely on GPS or inertial-based sensors, or any form of conical scanning/feedback from the Rx signal levels that can be very slow and introduce loss.

And of course, any satellite-based communications solution will work in complement with terrestrial wireless solutions, where necessary, (in terminals, in tunnels, in urban-canyons, etc.).

## Is there a Ka-band iteration of the system?

Phasor is currently focused on delivering products that operate in the Ku-band. However, there are growing demands for a Ka-band solution from Phasor.

The good news is that the vast majority of the system is identical between a Ku or Ka solution. Due to Phasor's baseband architecture, the translation to a Ka-band solution can be carried out with minimal risk – effectively a new ASIC tuned to the Ka-band frequency.

Phasor is working with a number of partners to kick-start a Ka-band development towards the second half of this year and is slated to offer its first Ka products in around 24 months.

Currently, Phasor is working on its land mobile and maritime data tests which are expected to last several months with the company's first release products.

## What happens on the ground is critical

There has been a significant shift in focus from the satellite or "space-segment" to the ground segment, because there has been a realisation that this is what will enable next-generation satellite connectivity. ESAs, like Phasor's, will be the critical mode of access technology for future communications and the entire satellite communications and broadband mobility industry is dedicating more time to ground infrastructure, discovering how it will enable next generation satellite networks to work as efficiently as possible. Phasor has been creative with its design and development of an incredibly compact, low-profile, automatic-acquire and tracking ESA, focused on enterprise and commercial markets, where the requirement for "mission-critical comms", for very high-gain, very high-quality networks is prevalent. Phasor will carefully complete its test phase and looks forward to its first product release enabling passenger and commuter rail, cruise ships, yachts, inter-city buses, airlines, government programmes, and many more big users of data to access the bandwidth they need in this new era of connectivity.

# ELeather Rolling Out Many Surprises in Berlin

ELeather, the global high-tech materials company, will return to Berlin this year with a number of exciting developments demonstrating how much the company has progressed since entering the rail market just five years ago.

Visitors to Stand 206 in Hall 1.1 can expect the unexpected from both the stand design and the exhibits being shown.

## On the stand

For Innotrans 2018, the company has worked in collaboration with industry-recognised designers to develop a number of interesting exhibits that will broaden people's horizons of the potential that ELeather has as a technologically advanced material, and to demonstrate its versatility in applying it to more than just a seat.

There will be various zones on the stand designed to engage with every visitor whether they are new to the brand or a long-term customer. The featured design wall is aimed at inspiring operators, seat makers and designers with how to successfully and efficiently differentiate between carriage class through design colour and texture – all with one material.

VIP guests will be invited to a new 'inspiration room' where they can get early insights into the latest product developments and innovation projects, and be introduced to the ELeather trend collection set to launch later in 2018.

## Brand-New Look

Building upon the success of the organisation's already established identity, ELeather has launched their brand-new look. The re-brand of ELeather is designed to satisfy the needs of all existing customers whilst simultaneously moving the brand to exciting new places, reinforcing the perception of the leather fibre composite in application, as an eco-friendly, differentiated material that out-performs fabrics as well as traditional and synthetic leathers.

Nicola Rapley, Marketing Communications Manager said: "Due to the rapid growth we've experienced over the past three years, together with key strategic partnerships and on-going award nominations, we decided it was time to give the ELeather brand a refresh to align with the types of industries, markets and people we are finding ourselves talking to. The clean-technology we use to create innovative products that perform unlike any other material is pretty cool and we wanted to reflect that through a more youthful and friendly brand appearance."

## A New Product on Its Way

On top of that, the team are launching a new rail product, specifically engineered for UK rail operators that would welcome the opportunity to use ELeather on their seats whilst meeting industry standards for BS 6853.

Louise Gear, Head of Sales said: "Codes of practice for fire precautions in the design and construction of passenger-carrying trains in the UK means 'low smoke' performance is critical to pass the standards and ensure rail operators can reduce passenger safety risks to fire. Until now, there has been no leather-based product available that can meet British Standards BS 6853, leaving operators little choice in seating upholstery materials. Now ELeather can offer an independently approved product that not only complies, but is intelligently designed and rigorously tested to deliver unparalleled performance while reducing overall operating costs."

ELeather creates a number of products designed for the rail market to suit the varying industry standards required in different regions. All products are rigorously tested for quality, compliance and in-service performance. The company prides itself on providing the industry with high-quality material solutions that offer maximum hygiene and comfort for passengers. The products also


make life easier for the operator as they are inherently easy to maintain and look like new for longer as they won't bag over time with passenger use.

## Onboard with Deutsche Bahn

Deutsche Bahn will showcase their 'Idea Train' a short walk away from the ELeather stand in Hall B. Here you can see what the future of rail transport could look like through a number of concept cabins designed around different passenger needs such as privacy pods, noise-cancelling chairs for business travellers, a children's play area for families and a fitness studio complete with exercise bikes and digital fitness coaches. ELeather were incredibly excited to partner with DB and design agency Neomind to develop the upholstered seating designs across multiple modules and encourage visitors to go and take a look to see the material in application.

## The Rise in Responsible Manufacturing

ELeather is recognised as an advocate for taking a more responsible approach to how products are made and how businesses operate, and it demonstrates this commitment in its own manufacturing. ELeather is an environmentally friendly material that is clean-tech manufactured from unused traditional leather fibre. The company saves thousands of tons of leather from going to landfill every year.

They operate a zero manufacturing waste-to-landfill policy and recycle over 90% of all waste, converting it into energy which is fed back into the process. The company's carbon footprint is minimized by selecting local partners for waste management and supporting local farmers by supplying them with waste converted into fertilizer.

There are no harmful adhesives used during the hydroentanglement process, only the power of water – 95% of which is recycled.

Louise Gear continues: "We see more and more rail operators adding sustainability goals to their long-term strategies, looking for ways to reducing emissions, waste and putting plans in place for other improvements to their environmental impact. ELeather is proud to partner with brands that take this approach as we understand that any positive change, no matter how small, can contribute to a much larger end result."

## About ELeather

ELeather take unused traditional leather fibre and through a totally unique and patented process, engineer a high-performance, technically advanced leather fibre composite.

ELeather products are designed and manufactured to provide exceptional characteristics delivering an eco-friendly material that out-performs traditional leather, synthetic leathers and fabrics. Our product collections are a true evolution in material technology – maximising performance and enhancing experiences in a more responsible way.

Exporting to over 40 countries with an established blue chip global customer base, the ELeather team are proud to supply over 150 airlines, including the world's four largest, as well as transforming over 12,000 rail vehicles and providing a better passenger experience to many leading bus operators and OEMs.

ELeather has received multiple technology and sustainability awards, including The Sunday Times's 'Tech Track 100' and 'International Track 200', Global Cleantech 100, the ACM Greener Pathways award, and the Financial Times's 1000 Companies to Inspire Britain.

Recognised as an award-winning, environmentally friendly materials technology company we provide a wide range of products, specifically engineered for leading brands across multiple industries worldwide, including transportation and consumer markets.

## CONTACT:

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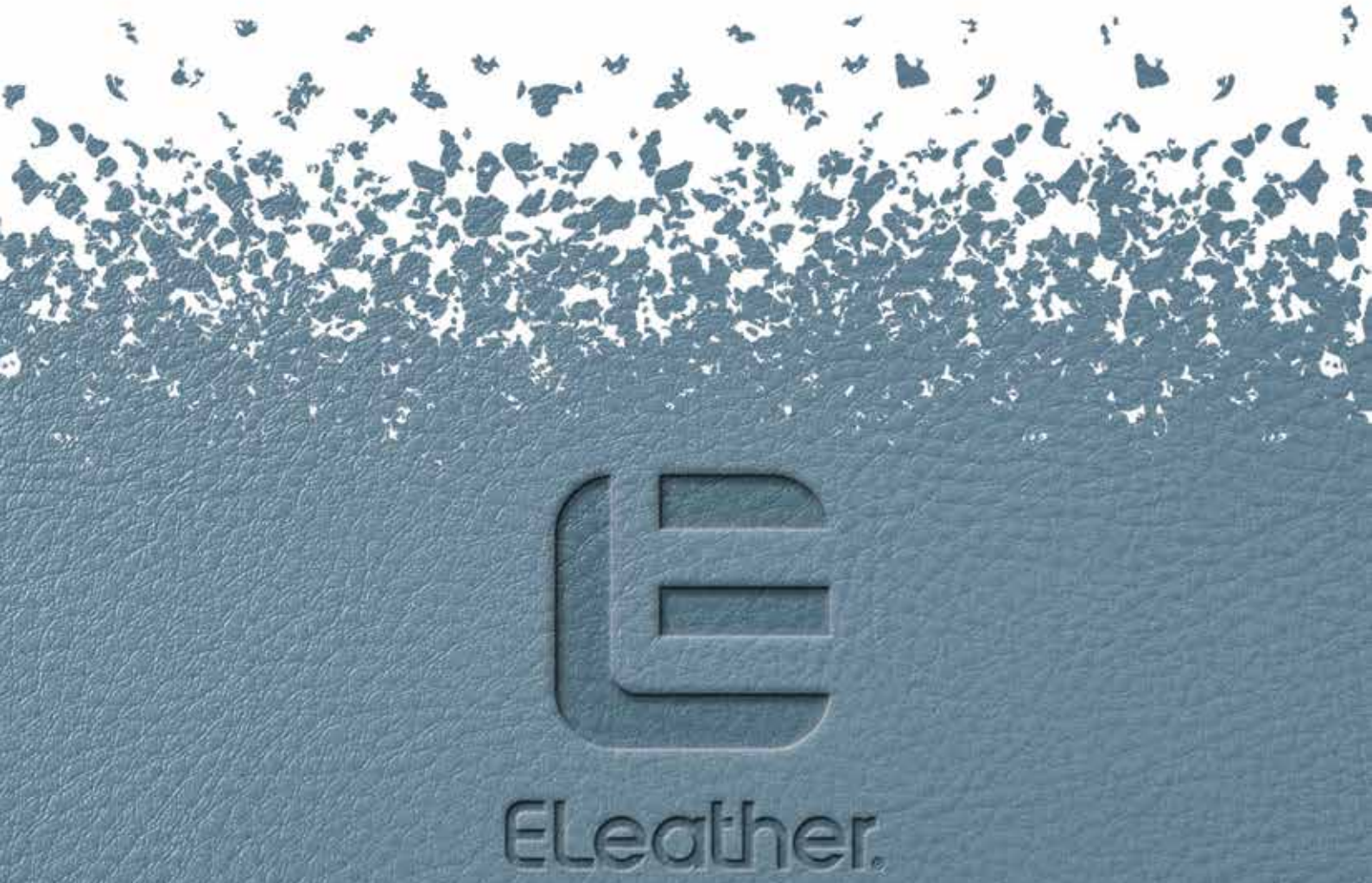
ELeather
LEATHER-EVOLVED



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# Leather fibre.
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# Rolling Stock Highlights at InnoTrans 2018

*By Josephine Cordero Sapién*

## Locomotives

- **Prima H4 (Outdoor Display 3/400)**

**Manufactured by Alstom**

**Highlight:** excellent energy-efficiency

The Prima H4 locomotive is part of a family of diesel and electric locomotives built by Alstom. Its predecessor, the H3, was first showcased at InnoTrans 2014. The Prima H4 is a shunting and works locomotive with a BoBo axle configuration that has a range of energy options available, from hybrid (battery and diesel engine) to bi-mode (catenary and diesel engine) and bi-mode battery (catenary and battery). The Prima H4 also has improved fuel efficiency when operated just in diesel mode. In its single-engine configuration its energy consumption is 15% lower than that of a traditional shunting locomotive.

Alstom was awarded a contract for 47 Prima H4 locomotives by SBB Infrastructure (Switzerland). The locomotive boasts a top speed of 120km/h and is fitted with ETCS. SBB Infrastructure is responsible for maintaining 3,000km of track. The Alstom Prima H4 will help the company reduce its carbon emissions by up to 6,000 tonnes per year, according to SBB Infrastructure Member of the Managing Board Désirée Baer.

The Prima H4 locomotive on display at InnoTrans 2018 will be one of the ones to be supplied to SBB Infrastructure, which are set to enter operation in 2019. There are currently 2,800 Prima locomotives in service around the world. Prima locomotives are used for heavy haul, freight and passenger operations as well as shunting and trackwork.

*Prima H4 locomotive © Alstom*

- **Push-Pull Trainset DB 102**
**(Outdoor Display 6/400)**
**Manufactured by Škoda Transportation**

**Highlight:** Czech company Škoda Transportation has designed a push-pull trainset for Deutsche Bahn to serve the Nuremberg-Ingolstadt-Munich line in Bavaria. The trainset will consist of a driving car, four intermediate cars, the end car and the latest Emil Zátopek electric locomotive (Škoda 109E3). This locomotive has a top speed of 200km/h but will run at a maximum of 189km/h on the designated route. It is compatible with both AC and DC catenary lines.
Each unit will have seating for 676 passengers as well as storage for 37 bicycles.

One special feature of these trains is that they have a special pressure-tight vehicle body allowing them to pass each other in tunnels at speeds of up to 300km/h. The locomotives have been awarded the European certificate TSI (technical specifications for interoperability) High-SpeedRST. More than 95% of the components the locomotive is made of are recyclable.

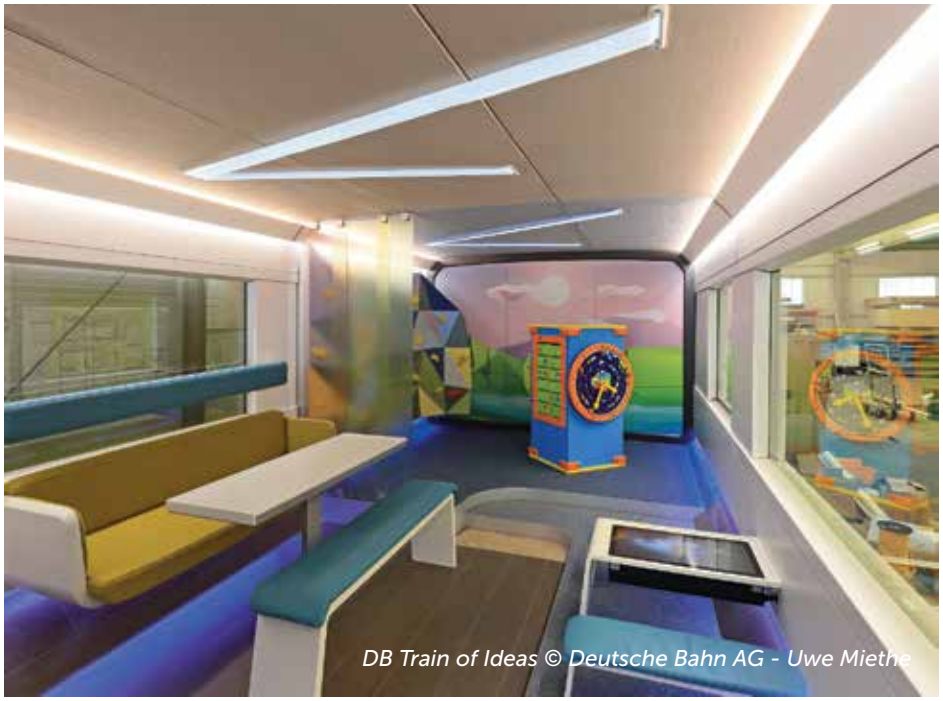
Škoda Transportation won the tender for six push-pull trainsets in 2013. The trainsets underwent testing in Velim, Czech Republic, and are awaiting introduction to the 171km Nuremberg-Munich high-speed line – part of the Trans-European Transport Networks (TEN-T) – this year. This locomotive could first be seen at InnoTrans 2016.


*Skoda push-pull trainset © Falk2 (CC BY-SA 4.0)*

DB Train of Ideas © Deutsche Bahn AG - Uwe Miethe

- **Deutsche Bahn Train of Ideas (Outdoor Display O/1)**

This walk-in full-scale model of a double-deck coach – 27m long, 3m wide and 5m tall – intends to show us today what rail travel could look like in the future. How could commuters use their time on the train more effectively? Could they perform tasks they otherwise struggle to find the time for? Could they, for example, get in their workout featuring a digital personal trainer while on their train journey home? Or what about getting some rest in a special power napping cabin? What about catching up with the latest news or sporting events in a



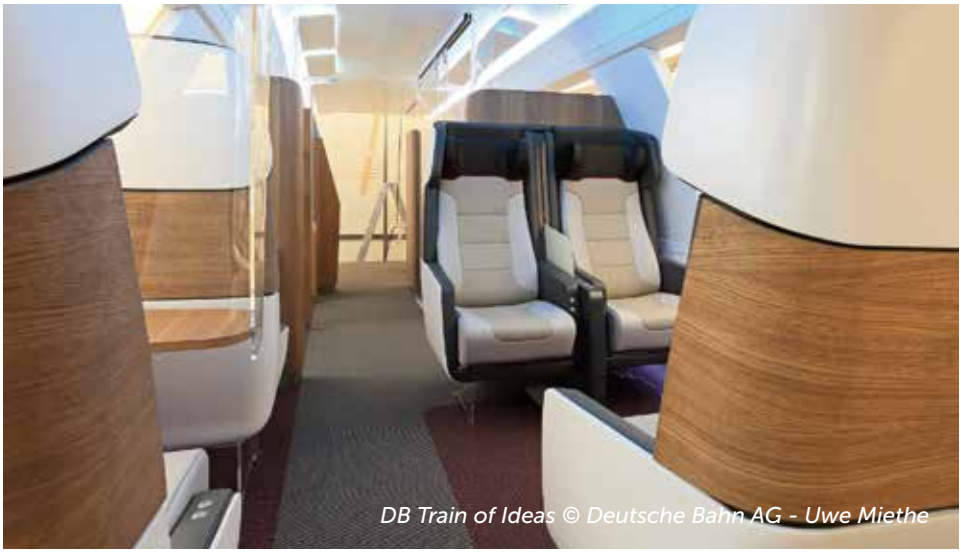
DB Train of Ideas © Deutsche Bahn AG - Uwe Miethe

public viewing area? Passengers travelling with children could enjoy designated family and children's areas. Those wishing for some peace and quiet to do some work can book a single-occupancy work module. Areas for working, relaxing, dining, fitness and family and all of them independently combinable to create the perfect train for every purpose.

The Train of Ideas aims to provide inspiration to those ordering trains to encourage them to be innovative and customer-focused in their choices.

DB Regio first introduced the Train of Ideas together with the Bayerische Eisenbahngesellschaft (BEG) in Nurember in November 2017. The BEG's spokesperson Dr Johann Niggl, commented that commuter behaviour in Germany was rapidly changing and rail services would have to adapt to that, especially in light of the autonomous vehicles of the future.

*DB Train of Ideas © Deutsche Bahn AG - Uwe Miethe*



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# Dina Consulting and Design

## Locomotive
## Consulting, Product Design
## Parts & Service

At Dina Consulting and Design, we pride ourselves on innovating a host of new electronic components that allow your operating and maintenance budgets to be more cost-effective.

**Locomotive**
**Layover Battery Charger**
480VAC / 575VAC to 74VDC

**LCD Indicator**
**Light Panel**

**Emergency Cab Light**
**with 90min Backup Battery**

**DC to AC Inverter**

**PA-IC Interface Unit**

**Dual Voltage Power Supply**

**Isolated Power Supply**

Our goal is to meet your expectations with products that meet your needs. We will design and provide a product specifically to your specifications as well as offer you products in our current portfolio that meet your needs.

# Dina Consulting & Design, LLC

At Dina Consulting and Design, we pride ourselves on innovating a host of new electronic components that allow your operating and maintenance budgets to be more cost-effective. By using our products, you will be able to reduce your operating and maintenance costs, using fewer parts, less labour and have less downtime for your fleet.

Here are some of our products that we believe will enhance your ability to reduce overhead costs, labour and downtime.

Our first product is the Locomotive Layover Battery Charger for 480VAC / 575VAC to 74VDC
The locomotive layover battery charger is designed for locomotive applications and rigidity. This battery charger can be easily adapted to any commuter locomotive, replacing the existing Layover Battery Charger. It is a direct replacement for the KBC Battery Charger product line for locomotive and heavy equipment applications.

Another product which we believe is an excellent add-on or replacement product for your fleet is the LCD Indicator Light Panel. The LCD indicator light panel is a direct replacement for the EMD egg crate-style indicator panel. It can be installed in the high-voltage cabinet, control stands, auxiliary cabinets, and head end power cabinet. The adjustable brightness, liquid crystal display allows for installation in low and high lighting conditions and the operator interface allows the engineer to adjust the intensity of the LCD by dragging his/her finger across the display. The touch screen interface allows the user to navigate through menu items and programme a number of functions. It can be configured to display key caps in different languages.

Yet another product that we believe is one the strongest in our portfolio is the Emergency Cab Light with 90min Backup Battery. This LED light is a stand-alone fixture and does not require any additional harnesses from the supercap supply. It is the ONLY product that meets the United States Federal Regulatory Authority (FRA) emergency egress lighting requirements without the variance that was given to United States Rail Companies. This variance was given due to lack of availability of a product that would conform to the Federal Regulatory Authority request. Dina Consulting and Design, LLC. has been the only company to provide a solution to US fleets without a derogation to the initial request by the United States Federal Railway Authority (FRA).

Once the 120VAC feed is lost the LED turns on for 90 minutes allowing illumination in case battery power is lost. It can also be used on locomotives that require emergency light to come on once the emergency brake is toggled.

It can be installed in a locomotive cab above each door or in all coach cars as emergency lighting.
It has a built-in potentiometer, so the light intensity can be adjusted for smaller or larger areas.
The operating voltage can be powered from a locomotive 74VDC system (56–90VDC) or 120 VAC Hotel (HEP) Power.

## We also have a complete line of locomotive 74VDC power supplies. Here are some of the features of these power supplies:

- **They are a fully isolated output**
- **The power supply's output works down to 30VDC to keep electronics energized during cranking**
- **Built-in state-of-the-art-technology**
- **Their sleek compact footprint design has been engineered for installation in tight enclosures**
- **There is no ventilation required as they are completely convection cooled**
- **The power supplies can be installed in any locomotive zone including the engine room compartment**
- **Some of the most common uses for these power supplies are windshield wiper power supply, electronic control module, and DEF heater power supply**
- **The most common use of our booster power supply would be any 74VDC system that resets with low voltage created when the engine is cranking**

### Examples are:

- **Electronic brake system that resets at 50VDC (FastBrake) / event recorder system**
- **PHW PTC system / PHW ACSES system / bearing monitor system**

There are more products that can help your operating and maintenance budgets, saving you on costs on labour, material and downtime. If you are interested in our product line, please contact **tony@dinaconsulting.com** or visit our website at

## www.dinaconsulting.com

**Dina Consulting & Design, LLC | 612 1st Street South Nampa | Idaho 83651 | United States**

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**www.mtm-power.com**

MTM POWER®

# Reliable and Innovative Power Supply for the Railways

## Safety in rail traffic presents a special challenge for all manufacturers and suppliers in this market segment.

Safety in rail traffic presents a special challenge for all manufacturers and suppliers in this market segment. Interruptions or defective rail transport can lead to dangerous situations. They can cause significant material damage, even endanger human lives and cause serious environmental harm. There is no simple possibility for repair works on railway installations during on-going operation and therefore no scope for error. Electronic systems need to function without interruption and without fail. Besides human error and system discrepancies, failure of components may lead to dangerous incidents on safety-critical railway installations. Therefore, there are strict requirements for power supply solutions for rail systems. This requires compliance with a large number of general norms and standards. Additionally, specific implementation determines the individual requirements on the power supply equipment.


*Power supplies applications for railways*

### Standards

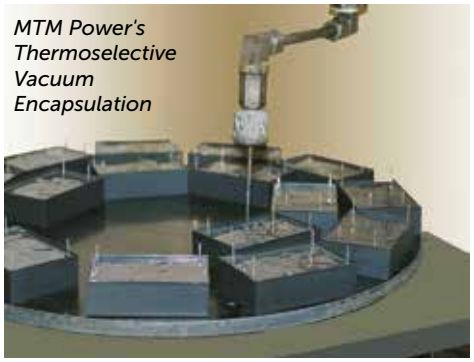
Whether significant temperature fluctuations, condensation, shock, vibration, electro-magnetic impacts, etc., electric components for the railway sector need to function safely and reliably even under extreme operational conditions – and that continuously over decades. Developers are able to reduce the probability of a system failure with fatal consequences early on – during the conception phase of the components. The development process therefore systematically follows norms and standards and covers the entire product development and implementation periods, including verification and documentation. Should a customer enquire about 'railway standards' this refers to the relevant comprehensive compliance with EN 50155. This standard describes the requirements for electronic equipment on railway vehicles. EN 50155 refers to different testing procedures and other standards such as EN 61373 in regard to

vibration and shock or EN 50121-3-2 for EMC (electromagnetic compatibility) requirements. The main criteria for the selection of DC/DC converters and power supply systems are the determination of the input voltage and the environmental conditions under which they operate. The most essential issues for environmental conditions are the environmental temperature, shock and vibration as well as air humidity. In addition input voltage fluctuations, disruptions and transients need to be taken into consideration as well as static discharges and EMC requirements. Vehicle manufacturers as well as suppliers of materials, components and subsystems are required to provide verification on compliance with EN 45545-2, which relates to requirements for fire protection in railway technology. This European standardised norm aims to reduce fire risk during a technical incident and to minimise the impacts of a possible fire. Key aspects are the reduction of flammable materials, a low flammability and the prevention of toxic fumes in case of fire. Manufacturers of power supplies are therefore required to choose components that are in compliance with this norm. Selected materials need to be certified by undergoing a fire protection test. The certificates need to be renewed according to schedule to ensure full compliance with EN 45545-2. All standards apply to the complete device fitted into railway vehicles. DC/DC transformers and subsystems are as a rule regarded as components. Products developed by a power supply manufacturer such as MTM Power® for use in railway operations are tested in accordance with these requirements. An additional assessment of all requirements for fire safety, EMC, ESD etc. in the end-user device is, however, essential.

## Durability and Availability of Standard and On-demand Solutions

Irrespective as to whether the components are used in new equipment or serve modernisation or maintenance purposes, reliability and robustness have the highest priority in the railway sector. Reliability of electronic components is decisive for critical and cost-intensive operational use ensuring that only durable products with a guaranteed life cycle prevail. Availability and durability are therefore of significant importance in railway technology.

Many applications place specific requirements on the form and size of construction as well as the type of connection. This often leads to complex solutions, customised for one particular customer. A 20–30-year service life is assumed for railway applications, whether for standard products or on-demand solutions. This time period exposes the products to extreme weather effects such as temperature fluctuations, mechanical shocks and vibrations, which are then taken into consideration in the use of consequent components as well as in the overall design of the equipment. The quality of the components and their construction also have an influence on the durability of the power supply. The developers are to select those components which show the least risk of obsolescence. At the same time new technologies need to be



*MTM Power's Thermoselective Vacuum Encapsulation*

introduced, incorporating risks affecting duration which are difficult to estimate. There are products for development to be redesigned for modernisation or maintenance of the whole system. In this regard updated converters have to be produced that are of the same type of construction, size, housing and function, with the aim of putting them into operational use as soon as possible. This requires many years of experience, the right development resources as well as flexible production in order to develop and produce high-quality products.

## Proven railway power of MTM Power®

MTM Power® has been a reliable and experienced partner of the railway sector for more than 25 years. The quality of innovative products as well as the flexibility and reliability of the company are the decisive factors. Sound technological and industrial know-how are combined with the highest quality standards. Comprehensive experience over many years directly impacts on the development of new products, as well as the knowledge gained from the close co-operation with the normative committees and customers.

MTM Power® offers a wide range of reliable and high-quality electronic power-supply products for the rail industry – for rolling stock and trackside applications. MTM Power® supplies railway projects throughout the world and is the preferred supplier to well-known manufacturers of locomotives, high-speed trains, EMUs and regional trains as well as metros. Just as insusceptible to mechanical stress such as shock and vibration as to environmental effects such as condensation, humidity and conductive dusts, the converters developed in accordance with EN 50 155, EN 45 545-2 are suitable for challenging rail operations and prove themselves time and time again throughout the world. They control the power supply to the control units of the air-conditioning systems, window heating, under-floor containers, hygiene cabins, driver control terminals, doors and much more. They are an emergency start installation enabling the starting of vehicles without supplementary emergency batteries.

Components made by MTM Power® ensure infrastructure operations such as controlling barriers, signals, switches and platform access doors. They also ensure reliable communication in the vicinity of railway operations. Compliance with standards is ensured by a patented technology (EP 1 987 708, U.S. Patent No. 8,821,778 B2) of the Thermoselective Vacuum Encapsulation of the power supply units and the DC/DC converters. A 'cemented joint' is created between the electronics and the solid encapsulation material. The term 'cemented joint' originates from the licensing process for electrical safety and describes the normative, proven durable and intractable capsulation. Ageing, heat and cold, rapid temperature changes and other environmental impacts are not to cause detachment, cracking or air pockets under any circumstances. The thermal coupling of the components by the encapsulation material to the surface of the housing or base plate prevents the development of hotspots and economically guarantees a broadly homogenous temperature distribution in the power supply unit.

The high degree of efficiency and use of suitable materials for the housing guarantee that the normative specifications for the touchable surfaces will be exceeded. A side-effect of the technology used is a much higher IP degree of protection than similar encapsulated standard power supplies. The determining component finally is the interface to the outside relating to connecting the power supply to lines and loads.

The use of suitable plug connectors with a high IP degree of protection to the encapsulated power supply has meant power units can be mounted locally where the power is needed. Protection against possible risks such as electric shock, fire or burning, mechanical damage or environmental effects is ensured by the power supply itself. The process of cooling the converter is achieved by thermal coupling through BPC (base-plate cooling) technology or – if necessary – by adding a heat sink element. Hence, all devices are especially designed to fulfil the operational requirements under rough and critical conditions as well as to comply with all the requirements and standards specific to railway operations. MTM Power® provides its customers with the corresponding CoCs (Certificates of Conformity) for fire protection, and short reports of the DVT (design verification test) and on all railway operation products..

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MTM Power's DC/DC converters for railway applications

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*MTM Power's DC/DC converters for railway applications*

# Ruggedized M12 IP65/67 Industrial Ethernet Switches

# NITE-XS


## Cabinet-free networking directly in the field: Reliable, ruggedized and efficient

The new **NITE-XS** M12 Industrial Ethernet Switches are fully suitable for railways. The excellent EMC performance characteristics (DIN EN 50121-3-2) and fire protection according to DIN EN 45545, make them comply with DIN EN 50155. Designed specifically for use in passenger trains, buses, commercial vehicles and agricultural machinery, the switches provide the perfect solution for a reliable and fully digitized on-board communications network. The world's most compact M12 switches impress with their high degree of protection, extended temperature range and outstanding electrical characteristics. The switches can be installed outside the switch cabinet in harsh environments, saving cabinet space and reducing the cabling effort.

- ▷ **IP65/67 metal housing**
- ▷ **DIN EN 50155 railway compliant**
- ▷ **10 ms power failure bridging**
- ▷ **Temperature range -40 to +70°C**
- ▷ **Dielectric strength of 2,25 kVDC**
- ▷ **Inrush current limitation**

**TERZ Industrial Electronics GmbH**
Gewerbepark 5a
49143 Bissendorf
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TERZ
Industrial Electronics

# Ruggedised M12 Industrial Ethernet Switches and USB Flash Drives

## Reliable Ethernet-based Communication and Data Storage Under Harsh Environmental Conditions

The communication network in trains, trams and subways is increasingly being used for more and more services. This includes applications which are available to each passenger individually such as internet access via Wi-Fi and also information services and security related applications such as passenger information systems, video surveillance and passenger counters at the doors. All these services and systems depend on the permanent availability of the network. The TERZ Industrial Ethernet Switches are the perfect solution for building a reliable, robust and efficient train network. In addition to reliable data transmission, the local storage and retrieval of data, for example for the commissioning of devices, is becoming more and more important. With the TERZ Industrial M12 USB Flash Drives, there is an efficient railway-compliant solution available.

### Industrial Ethernet Switches M12

The requirements which are placed on components for use in trains are among the most stringent in the industry. Decisive here is not only the resistance to shock and vibration, but also the electrical properties that must be maintained under all climatic conditions that might occur. The new NITE-XS switches with vibration-proof M12 connection technology are specifically designed and developed for use in harsh industrial environments outside the control cabinet and for networks in passenger trains, buses, commercial vehicles and agricultural machinery and meet the requirements of EN 50155. With 4, 6 and 8 D-coded M12 ports and a rugged IP65/67 metal housing, the switches are completely dustproof, protected against water jets and even withstand temporary immersion in operation. Starting up the entire on-board system in trains and buses is a critical moment. Due to the possibly of high current pulses occurring when the connected components are started up, the load of the power supply can lead to errors. All TERZ switches have an inrush current limitation, through which the load on the supply voltage is reduced and helps to ensure a safe on-board system start-up. Furthermore, the connection of the power supply is reverse polarity protected and the pin assignment for the A-coded connection can be done flexibly. Errors during commissioning can thus be prevented.

## Ultra-compact Design

Just like in the automation industry, the railway sector is not only planning networks for new trains, but also modernising existing ones. Frequently, the space which is available for additional components is limited at the locations where additional Ethernet ports are required. The TERZ switches are the world's most compact M12 Ethernet switches and are therefore ideal for the cabinet-free decentralised connection of end devices. Thanks to the different number of port variants, the required cable lengths can be optimised and the installation effort can be reduced through decentralisation. The extremely small NITE-XS4 with 4 Ethernet ports are the ideal solution for retrofitting an electronic rear-view mirror system or outdoor cameras to monitor the flow of passengers while boarding and alighting at the platform. Another way to save costs for cabling digital end devices is to use Power over Ethernet (PoE). The transfer of data and the supply of energy are done together via the Ethernet cable. Camera systems and various sensors which support the PoE standard are increasingly found in the market. Due to the extended temperature range from -40 to +70°C, the switches can be mounted outside the control cabinet even under temperature fluctuations, for example below the roof or below the floor plate. The assembly of the switches is done directly on the mounting wall using M6 screws. The functional earth is connected via a separate wiring terminal, especially if the mounting wall is not electrically conductive and not grounded. The mechanical and electrical connection can be carried out independently of each other.

## EN 50155 Conformity

In addition to the environmental and mechanical requirements for use in railways, strict specifications with regard to electrical properties must also be observed. The stability and tolerance of the internal power supply are crucial for a fail-safe operation. The NITE-XS switches have a high dielectric strength of 2.25 kVDC, between the 3 isolation groups: electronics, Ethernet ports and housing. The positive and negative poles of the power supply are thus isolated from the housing and the occurrence of unwanted earth loops is prevented. With voltage drops on the supply line up to 10 ms and fluctuations in the rated voltage of up to 40%, the switches run reliably and maintenance-free even after long use in the vehicle. All railway-compatible Ethernet switches from TERZ meet the fire protection requirements according to EN 45545. This and all other standards such as EN 50155; 61373; 50121-3-2 were tested in an accredited environment. During development, it was ensured that the mechanics and the electronics operate together perfectly and so all electrical characteristics, such as the contact resistance between the shield and the housing or the bridging in case of voltage drop, meet the normative requirements over the entire service life.

## Reliable Data Storage

It is not just reliable network communication that is needed, however: because of the increasing digitisation and rapidly growing number of devices in the field, it is more and more necessary to store data directly in the application and transfer it to other devices manually, but this without the need for a network connection. Two possible scenarios could be uploading a configuration file for the commissioning of devices and system modules and evaluating sensor data or camera images. The TERZ KALIBER-XS1 M12 USB Flash Drives are the ideal plug & play solution and have been designed and developed for use in continuous operation under extreme environmental conditions. A high dielectric strength and the robust IP65/67 stainless steel housing enable the use according to EN 50155 at an ambient temperature of -40 to +70°C. However, it is not only the mechanical protection against external environmental influences which is important, but also the secure storage of the data. For this purpose, a fault-resistant SLC NAND Flash is used, which operates together with a powerful memory management to ensure maximum resilience and security in data storage. Over-Provisioning combined with high-performance Wear-Leveling and Error Correction Procedures (ECC), ensure extended retention of data and longevity of flash cells (Endurance).

# Fact File: Panama Metro – Line 2

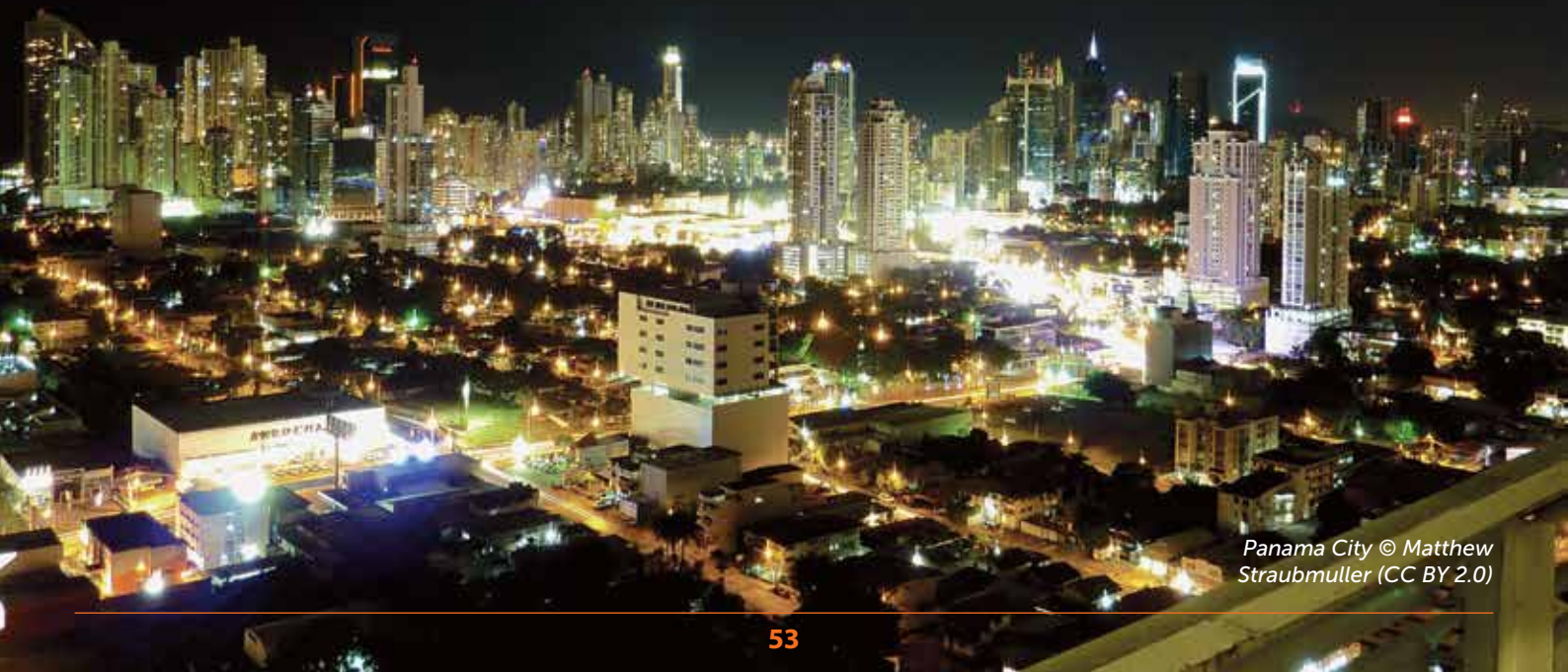
## Panama City is the largest city and capital of Panama and has an urban population of almost 900,000.

*By Josephine Cordero Sapién*

The first line of the Panama Metro, in Panama City, was inaugurated in April 2014. This line, Line 1, is served by three-car and five-car Alstom Metropolis trainsets. Thales provided the control centre and the automatic train supervision system, the network infrastructure, communication and security solutions.

Of the four remaining planned lines, one is currently under construction: Line 2.

*Metropolis trainset © Alstom*



*Panama City © Matthew Straubmuller (CC BY 2.0)*

*Metro Station © Mariordo59 (CC BY-SA 2.0)*

**Where:** Line 2 will service the eastern part of the city. Panama City has a major issue with road congestion and due to the narrow and elongated configuration of the metropolitan area, road expansion here would be impracticable – let alone undesirable. The Panamanian government notes that the eastern regions of the city have a commute of ninety minutes to two hours to the city centre, and their mobility conditions are generally precarious. The new metro line will not only reduce travel times, it will be an environmentally friendly, clean, safe and reliable transport option for the population.

Line 2 will have a length of 29km and run from Parque Urraca to Felipillo. Construction has been divided into three phases: from San Miguelito to Nuevo Tocumen, from San Miguelito to Parque Urraca and from Nuevo Tocumen to Felipillo. The stretch from San Miguelito to Nuevo Tocumen, Phase 1, will feature a 21km elevated viaduct with 16 stations. All stations will have taxi and bus areas. Those closer to the city centre will make more room available for this, while those stations in areas where car ownership is higher will have parking. The aim is to discourage driving into the city.

The construction project was awarded to the Line 2

Metro Trains © Mariordo59 (CC BY-SA 2.0)

Consortium, consisting of Odebrecht (Brazil) and FCC (Spain). Construction then began in 2015. Delivery of the line is expected in April/May 2019, with first test runs expected in December 2018. There are also plans to open the metro partially in January to provide public transport during the Catholic World Youth Summit being hosted in the city.

**Line 2 Capacity:** It is estimated that when fully complete, Line 2 will be able to transport 40,000 passengers per hour. To meet demand at peak times the headway between trains is proposed at three minutes, which would require 21 five-car trainsets.

**Rolling Stock:** In June this year Alstom delivered the first of 21 Metropolis trains for Line 2. Alstom will also be providing its Urbalis CBTC solution so that trains can run safety at higher speeds with reduced headways. The trains will be fed through a system of rigid catenary lines of 1500V DC.

**Rolling Stock Maintenance:** Line 2 will have facilities for cleaning and parking the rolling stock as well as workshops where preventive and corrective maintenance will be performed.

Once the entire system is complete, it is estimated that the metro will be used by a million passengers a day.


© Brian Gratwicke (CC BY 2.0)

# MECHAN LIFTS INNOTRANS PRESENCE

## Renowned rail depot equipment specialist, Mechan, is preparing to raise its global profile further by taking its largest stand to date at this year's InnoTrans trade fair in Germany.

Following its busiest exhibition ever in 2016, the Sheffield-based manufacturer has committed to a bigger and more prominent space in the UK Pavilion in September.

A fully working version of Mechan's flagship lifting jacks will form the centrepiece of its eye-catching display on Stand 206F in Hall 2.2. Its sales and engineering teams will be on hand to update visitors on the progress the firm has made in the last two years and provide information on its wide range of lifting and handling products, which include bogie drops, traversers, lifting jacks and much more.

Mechan's engineering manager, Martin Berry, will be heading up the InnoTrans team. He said: *"It has been an eventful two years for us since InnoTrans 2016 and we are looking forward to meeting colleagues old and new in Berlin to showcase our development. We have much to talk about, not only our buy-out by France's CIM Group, but also the launch of our new lightweight jacks, designed specifically for the tram and light rail markets."*

These cost-effective lifting jacks are smaller and more agile than their heavy rail counterparts. They have a different base arrangement and built-in wheel assembly for ease of movement around a depot, along with a lower lifting height to cater for the proximity of car and rail, but they retain all of the features that make Mechan products so great.

That includes its jack control system, which allows one user to operate synchronised sets, eliminating decoupling. It is the most flexible and technically advanced in its field, using a portable panel to give the operator freedom to move to the best location to monitor the lift

more effectively. Constant feedback is provided as jacks are raised or lowered, making it easier to diagnose faults, as vital data about maintenance and servicing is displayed.

Using a combined power and data cable, Mechan has also been able to minimise installation costs, whilst inverter technology produces power savings during operation, compared to similar products. The controller caters for trains with numerous cars and large numbers of jacks can be operated together. The longest system produced to date is a 44-jack chain, which is used to service 11-car Pendolinos on the UK's West Coast Mainline.

Martin added: *"We have listened to our light rail customers and developed a version of our popular jacks that is tailored entirely to their needs, making us even more competitive in this specialised market. Each order is bespoke and we are happy to discuss specific depot requirements during our time at InnoTrans. Visitors can make an advance appointment, or simply call at our stand for more information."*

Mechan is working with parent company CIM to deliver a major project to construct a second metro line in Panama City. A set of 20 lightweight lifting jacks, four turntables (which are used to transfer bogies between roads or turn wheelsets around) and 20 vehicle stands have been constructed for a new build depot in the republic's Nuevo Tocumen area.

The 12-tonne jacks left the UK in July following successful factory acceptance tests and will be commissioned by Mechan's engineers on a forthcoming trip to Panama, in conjunction with CIM. The firm has a contract to install and maintain 50 kilometres of track, catenary and workshop equipment, as part of the Panama City Line Two project, which will link the western district of San Miguelito with Felipillo in the east.

*Mechan's Zahir Altaf and Lindsey Mills showcasing their most recent Investor's in People certificate*

This is the first time Mechan has joined forces with CIM, since its acquisition in March last year and this is its very first order to the Americas – the only continents it had yet to supply. Since the takeover, international development has accelerated dramatically and enquiries are being received from across the globe.

Completion of the Panama City Line Two project is expected in 2019, introducing 21 five-car Alstom Metropolis trains to the capital, significantly improving travel options for its 1.4 million inhabitants. CIM completed Line One in 2014 and has, since then, worked in close partnership with the Panamanian Ministry of Education at a professional railway maintenance training centre.

Progress for Mechan under CIM has been rapid at home and overseas and recently led to its values and ambition being commended by an independent inspector. During its assessment for reaccreditation to the Investors in People standard, the firm was described as having a "strong purpose and vision to be recognised as the best in the industry."

This is the fourth time Mechan has been granted the accolade, having been evaluated against the nine key indicators of high performance that comprise the Investors in People framework. It was praised for its open and friendly environment and positive


*CIM Groupe's Tatiana Ayite and Stephane Reau overseeing Mechan's Panama jacks factory acceptance test in Sheffield*

support for learning and development. Regular communication between managers and staff was noted, which encourages responsibility and pride in what they do.

Ann Lyon, representing Investors in People North of England, conducted Mechan's reaccreditation. She said: *"People are proud of what they do, with strong values of quality, responsiveness, customer service and support for each other.*

*"Managers and people demonstrate a clear understanding of what has made the business successful in the past and are committed to its future success."*

The firm first gained the standard in 2009 – its 40th anniversary – and will now hold the mark of quality for another three years. Director Zahir Altaf added: *"We are very proud to receive such a glowing report and to be representing the very best in people management. Our close-knit team works extremely hard to uphold Mechan's reputation for safety and reliability and this reaccreditation is a result of continued endeavour at all levels."*

To find out more about Mechan's new lightweight jacks or its extensive portfolio of rail depot equipment, drop by **Stand 206F** in the **UK Pavilion** at InnoTrans in Berlin from September 18–21. Alternatively, telephone **(0114) 257 0563**, visit **www.mechan.co.uk** or follow the company on Twitter, **@mechanuk**.

MECHAN
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CIM
YOUR RAILWAY AND URBAN TRANSPORT PROJECTS
OUR INTEGRATED SOLUTIONS

# PlasserSmartMaintenance

## Interconnected machines add value

Plasser & Theurer is again present in the outdoor area of InnoTrans – two machines will be on display with only one of them a track maintenance machine proper. Digital products are picking up speed and create the basis for new ways forward.

Mechanised track construction and maintenance are setting their signals to digitalisation and a wider range of functions. Today's track maintenance machines are advanced measuring equipment, auxiliary vehicle, living space and figurehead all in one. With this approach Plasser & Theurer meets the requirements of infrastructure managers, rail operation managers, contractors, workers and abutters – and in so doing, it is seen as a representative of the rail transport system. In spite of all this, the tried and tested basic functions of lifting, lining and tamping – in other words of ensuring proper track geometry – are retained but follow new propulsion and control systems and communication paths that are interconnected in real time.

With the two machines on display, Plasser & Theurer will demonstrate this interlinkage and its mode of action:

### Digital twin meets absolute track geometry

In the outdoor area Plasser & Theurer will show its EM100VT (Outdoor Display 3/407), the key champion of innovation for the development of digital products for railway tracks. An inertial track geometry measurement system is combined with a novel optical fixed-point procedure and GNSS/GPS georeference data. Previously, absolute track geometry could only be identified during special track possessions at walking speed. The new method is the first to capture absolute track

geometry at speeds of 100 km/h and more – it sounds like a record-breaking achievement when we think of the former equipment for trackside surveying, which had to be re-adjusted manually at every mast.

For the first time, this recording car sends data on absolute track geometry via the cloud directly to the maintenance machine! In future, the data will serve even more the optimising of asset and life-cycle management systems of rail infrastructure in a sustainable and holistic manner.

## Universal tamping machine for tracks and turnouts

The Unimat 09-4x4/4S $E^3$ (**Outdoor Display 3/408**) on show heralds a new era of tamping machines. Some of the new features are visible at a glance, while the added value of many of them can only be seen in daily operation.

- Design: for many operators the cabin is their second home. Understandably, ergonomics and features for fatigue-free work have become increasingly important in equipping the machine. Optimised user-friendliness thus is of great concern to Plasser & Theurer, with the ultimate aim of providing track maintenance machines that are more efficient and safer to work with and that deliver a better overall result.

- SmartALC: as an automatic guiding computer for track geometry, SmartALC now offers a new spot tamping tool for targeted spot work in the track. In addition, the guiding computer will be upgraded with a BIM (Building Information Modelling) interface.

- PlasserSmartTamping – The Assistant: this assistant system, which was already demonstrated at the iaf in in Münster/Germany, relieves strain on operators by making clear recommendations on lifting and lining and on how to set the tamping units.

## Individual configuration of your machine

On display at InnoTrans will be a tamping machine for tracks and turnouts that uses the new fully electronic $E^3$ propulsion during work and transfer. Visitors will be invited to experience the individual configuration of a Unimat 09-4x4/4S with a VR configuration tool at our exhibition stand. You will be able to discover additional potential: an inertial measurement system for track geometry, i.e. the PlasserSmartTamping – The Assistant system, or a trailer module for sweeping and shifting ballast. These and many more features can be integrated into a tamping machine in future.

## Datamatic 2.0 interconnects operation and maintenance

As a browser-based user front end, Datamatic 2.0 provides an individualised data mix in real time. A single machine is already a useful source of information. The cost advantage generated by the system is of course greater when one manages a

whole fleet of machines. Live information, such as location of machine(s) and direction of work, supports dispatchers in daily work. Regular reporting of operational parameters and maintenance data forms the basis for condition-based maintenance.

The new MachineMaintenanceGuide MMG is a digital maintenance record that communicates pdf reports directly to Datamatic 2.0, thus ensuring centralised collection of all servicing jobs done on a machine that is in daily use. This makes it easier for fleet managers to keep an overview of their machines.

## Replacement tamping unit with servicing package

New Plasser & Theurer tamping units come with exceptionally long warranties of 24 months or 500,000 tamping cycles. Another benefit is a package of five visits (minimum) by a service engineer and an additional two years of support. This is how Plasser & Theurer's after sales service is true to its motto 'We care about your machine'. The common goals of these measures is to ensure more tamping cycles, reduce unexpected costs and extend the life of your machine.

The long-established company from Austria has thus enlarged its range of offers not only with new machine concepts but also with after sales programmes for the entire life-cycle as well as with digital products that help get track maintenance into shape for a new era.

We are looking forward to your visit to our exhibition **Stand 222 in Hall 26** and to our machines shown in **Outdoor Area South 3/407** and **3/408** at **InnoTrans**, 18 to 21 September 2018. **www.plassertheurer.com**

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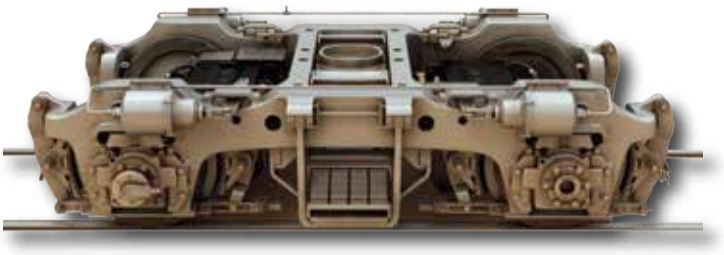
# Innovation, Engineering, Manufacturing and Distribution

## at InnoTrans 2018



Among the many parts and components that PowerRail, Inc. supplies, a few may catch your eye while being premiered at InnoTrans 2018. PowerRail proudly offers LED bulbs for all applications, including a 60W LED Headlight/Ditch Light, the new 50A19 6W LED Rough Service Bulb, and now available, a T8 LED Tube with backup power.

With integrated battery backup power for multiple emergency applications, this T8 LED Tube can be used for facilities, passenger transit LRV, locomotives and cars. The T8 LED Tube is designed to replace all external backup power ballasts and drivers to keep lighting ON in the event that the main voltage is off. It also incorporates test buttons to ensure battery is operational for maintenance personnel or fire marshal certification, and can be suited to operate on various voltages. Perfect for use in open or enclosed luminaries where backup power is required in the event of emergency or main power shuts off.

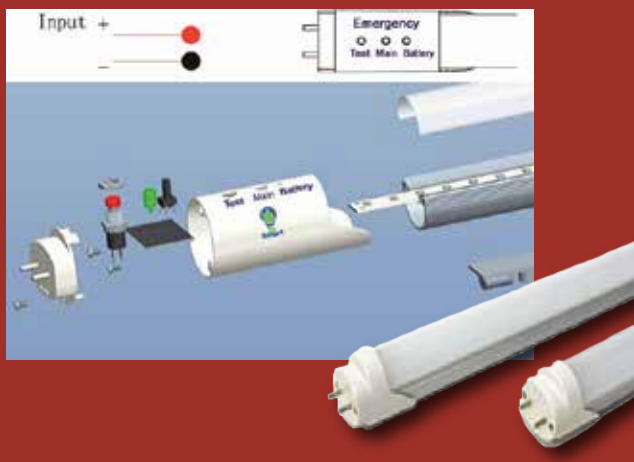
Another exciting announcement from PowerRail is the formation of a new member in the PowerRail family of companies: PowerRail Engine Systems. PowerRail Engine Systems is an engine company offering rebuilt engines, turbochargers, roots blowers, water, fuel, and oil pumps, as well as power assemblies. With AAR M-1003 Certification, they will offer a complete line of **new** and **remanufactured** products that offer true reliability and quality for all demanding applications.

Also recently added to the PowerRail product line is truck (bogie) assemblies and truck parts. Product offerings include, but are not limited to, centre plates, bowl and pedestal liners, elliptical springs and coils, gearcases, slack adjusters, break riggings, rubber parts, and bushings.

PowerRail is a certified AAR M-1003 distributor, manufacturer and remanufacturer of aftermarket locomotive parts and components, offering a wide range of products. As North America's leading aftermarket parts provider, PowerRail supports both EMD and GE locomotives. In addition to their broad

locomotive line, PowerRail also provides products for the passenger transit, marine and power generation markets.

PowerRail's offering of products includes new and their **True Blue™** unit exchange remanufactured components to accommodate any budget. Backed by their extensive engineering and development departments, they continually strive to provide enhanced products that reduce costs associated with field failures and downtime. In addition, their recently trademarked **New-UX™** programme allows customers to send a core to one of their remanufacturing facilities and in return, receive a NEW part at a discounted rate. The customer receives true reliability in a brand new part, while also clearing out unwanted rebuildable cores, which can be recycled and remanufactured for others.




PowerRail is a United States-based company, with additional locations in various parts of the world. Originally formed in 2003 in Wilke-Barre, Pennsylvania, today the PowerRail Corporate Offices and Main Distribution Center are located on a 7+ acre site in Duryea, Pa. The PowerRail Family of Companies proudly offers a wide range of rail-related parts and components. Locations include PowerRail Corporate, Avoca Rail, and PowerRail Industries all of Duryea, Pa; Cooper Bearings of Georgetown, Del; PowerRail Manufacturing, Rail & Traction North America and PowerRail Electronics Technology of Connersville, Ind; PowerRail Locomotive Services of Monroe, Ga; and PowerRail Mobile Maintenance with two locations, offering field services from Coast to Coast. International locations include PowerRail Australia and PowerRail Europe.

# Discover intelligent sensors

## INNOVATIONS TO SIMPLIFY RAILWAY OPERATIONS.

**EXPERIENCE THE FUTURE OF TRAIN TRACKING:**

## InnoTrans in Berlin
## 18–21 September 2018
## Hall 25 | Stand 232

**www.frauscher.com/innotrans**

Digitalisation opens up new possibilities in generating a wide range of highly valuable information.

Frauscher combines proven best-in-class technologies with new digital ideas and creates intelligent wayside sensors that deliver accurate data. Consistent developments using the latest technology, has taken track vacancy detection and condition based maintenance to the next level.

TRACK MORE WITH LESS

FRAUSCHER SENSOR TECHNOLOGY

# Intelligent Sensor Concepts: For Tomorrow's Railway Industry

## Digitalisation opens up new possibilities to generate a wide range of highly valuable information.

*The Frauscher Tracking Solutions FTS are collecting real-time data by transforming a fibre optic cable into a distributed sensor*

This will also affect systems related to traffic or infrastructure management. Their efficiency can be increased by continuous developments using the latest technology, enabling them to keep up with latest requirements. Harnessing this potential is a task for the whole railway industry, in order for it to remain a competitive mobility provider.

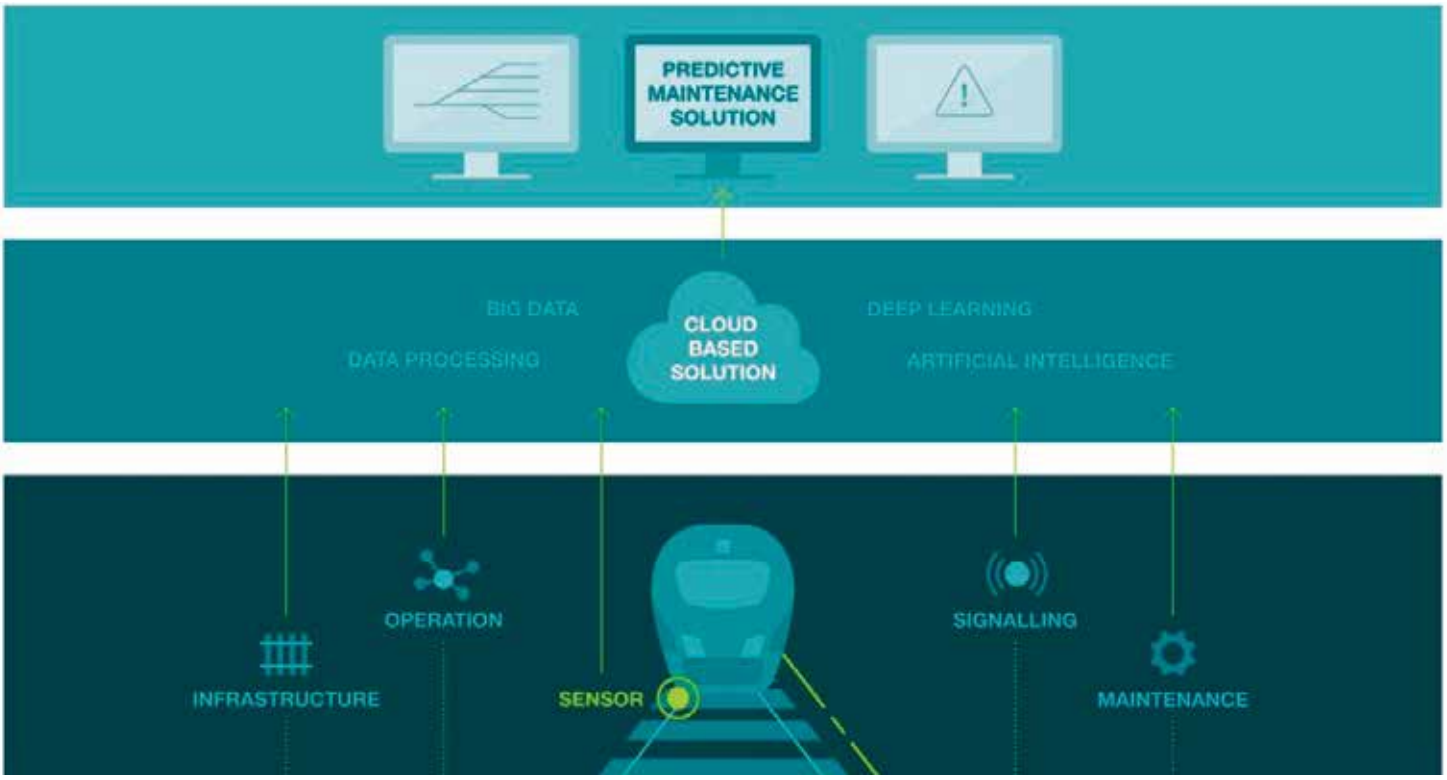
Against that backdrop, Frauscher presents its latest products at this year's InnoTrans, under the motto: "Discover intelligent sensors: innovations to simplify railway operations". A new smart wayside sensor, which combines proven best-in-class technology with digital concepts takes track vacancy detection to the next level. Also, the technology behind the company's DAS-based distributed sensing system, Frauscher Tracking Solutions FTS, has been developed further. Thereby the system now allows for optimised real-time train tracking and supports maintenance strategies with continuous infrastructure monitoring.


*Integrated evaluation, additional functionalities: digital output and proven capabilities characterise the new Frauscher wheel sensor*

## Intelligent Sensor for More Efficient Track Vacancy Detection

Based on proven know-how and the concept of the Internet of Things (IoT), Frauscher has created a new wheel sensor. The evaluation of the signal has been integrated directly into the sensor, which now works as an intelligent device on track. By integrating additional sensing modules, it generates even more information than established models, enabling additional and more efficient railway applications to be implemented. The sensor's digital output and the ring architecture – based on a specifically developed bus system – hugely reduce the cabling requirements. With this innovation, Frauscher will again set a new benchmark in track vacancy detection.

*By continuously monitoring the acoustic signature of the wheel-rail contact, FTS support condition based maintenance strategies*




## FTS: Continuous Train Tracking Using Distributed Acoustic Sensing

Distributed Acoustic Sensing (DAS) offers a huge potential – requiring nothing more than a single glass-fibre, pulsed by a laser. By evaluating the changes in the reflection of these pulses, the fibre is converted into a sensor that runs along the track. This sensor is capable of detecting sound waves and vibrations. Solutions based on this technology are able to continuously track the position of a train and monitor the condition of complete railway networks.

Intensive research and development activities as well as close collaboration with operators have increased the capabilities of the DAS-based Frauscher Tracking Solutions FTS. In various field installations, a range of applications has been realised. These installations have allowed improvements to be made, enabling Frauscher to optimise DAS for the railway industry.

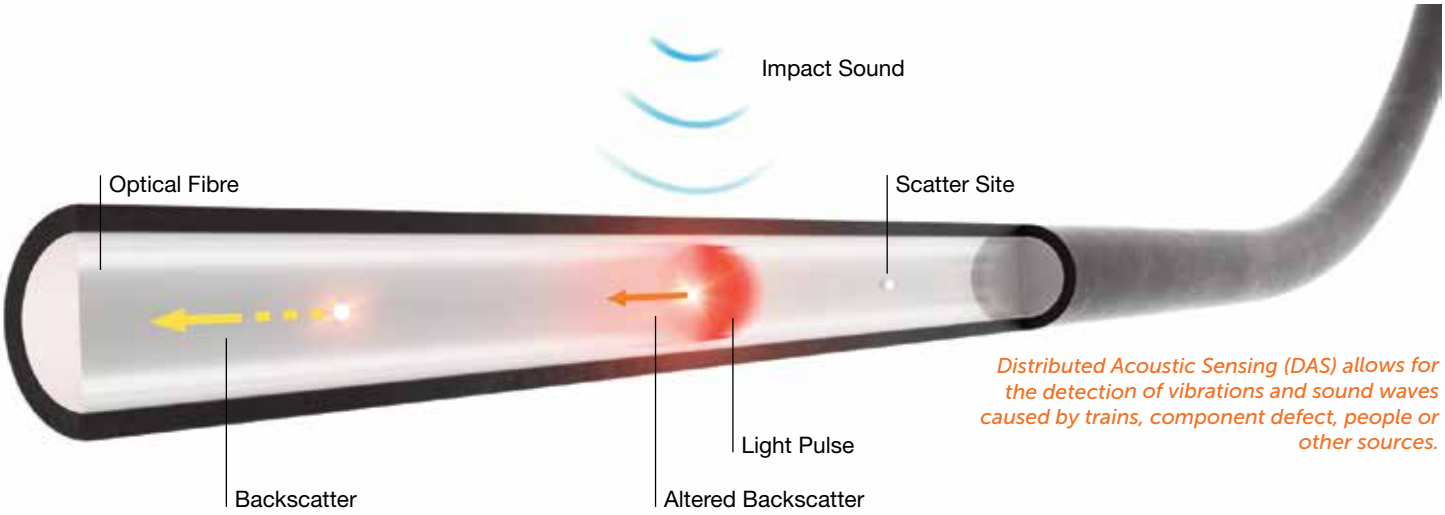
## Train Tracking: Localisation in Real Time

According to the requirements of train tracking as a main application, the focus was on enhancing the accuracy and reliability of four key data sets: front end of a train, rear end of a train, speed and direction. Continuous calculation of an estimated time of arrival (ETA) at a specific point can optimise applications such as passenger information and platform announcements. Exact train position and train specific speed profiles enable more efficient train movement and traffic management.

Therefore, the measuring method was developed further to optimise the output of the FTS. By increasing the number of interfaces with other sensing systems, additional data can now be evaluated allowing even more valuable information to be generated.

## Continuous Monitoring of Assets

FTS constantly monitors the acoustic signature of the wheel-rail-interaction. Using optimised algorithms, this provides insights into the change of the condition of various assets when trains are passing. Degradations of and damage to fixed infrastructure components, such as the rail, fastenings, sleepers or the track bed are monitored. Based on on-going trend analyses using defined indicators, warning or alarm messages are sent to the infrastructure manager. The operator is then able to identify maintenance tasks at a very early stage. This means planning, control, execution and maintenance activities can all be performed much more efficiently. Thus, FTS supports a complete shift from regular and time-based




*Distributed Acoustic Sensing (DAS) allows for the detection of vibrations and sound waves caused by trains, component defect, people or other sources.*

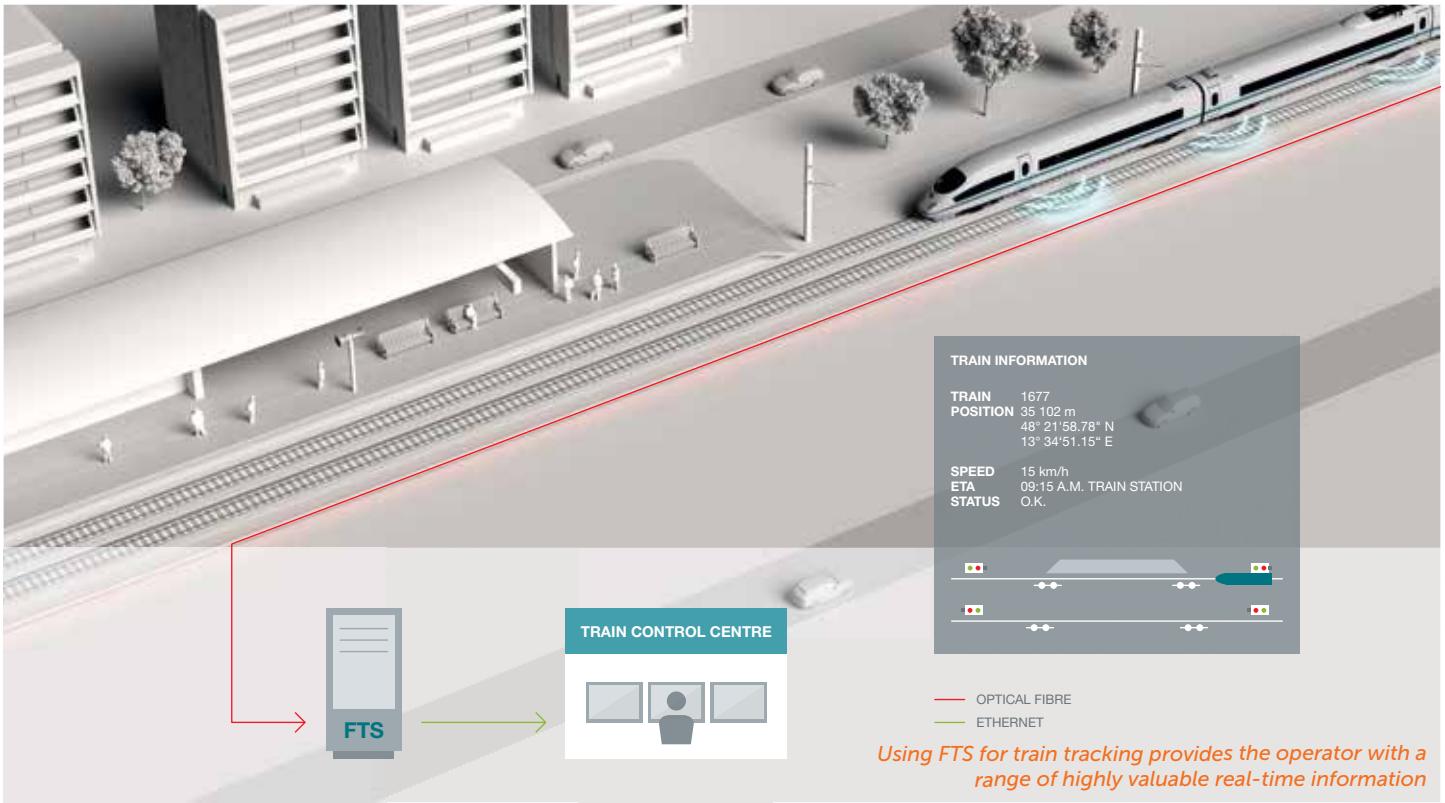
maintenance cycles to condition-based maintenance.

## Safety and Security Applications

Railway operations depend on a high level of safety. To that end, FTS provide a comprehensive solution ranging from worker safety to protection against vandalism. By detecting footsteps of people as well as activities, such as sawing or digging, the system supports security staff in their daily tasks.

## Explore a New World

Frauscher Sensor Technology makes it simpler for system integrators and railway operators to obtain the information they need to run, monitor and protect their operational network. Ever since its founding, the company's philosophy has been to develop market-oriented solutions, using modern technologies to meet the industry's latest requirements. The experts from Frauscher are in close contact with operators and system integrators all over the world. Become a part of the railway industry's future and meet **Frauscher** at **InnoTrans 2018**, **Hall 25, Stand 232** to discuss the possibilities of how to create intelligent sensing systems for tomorrow's railway industry with our experts on-site.




*Using FTS for train tracking provides the operator with a range of highly valuable real-time information*

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*ENSCO Rail is a wholly owned subsidiary of ENSCO, Inc.*

# We Keep Rail Moving

ENSCO
Ideas to Reality®

## The ENSCO Rail suite of track inspection systems help railways maintain infrastructure to ensure people and assets move safely and efficiently.

ENSCO Rail, a leading global supplier of track measuring and evaluation systems, will be exhibiting at InnoTrans 2018, showcasing a complete suite of track inspection systems that help passenger and freight railways improve operations.

ENSCO Rail has a long history of leading the rail industry in developing new, advanced technologies for railway maintenance planning. Our latest advances in track inspection, including autonomous inspection systems, automated machine vision inspection and automated maintenance planning tools, provide the most efficient means to monitor railway infrastructure condition and plan track maintenance.

*The Heavy Hi-Rail Track Inspection Vehicle offers track geometry, rail profile, and joint bar inspection.*

### Accurate and Objective Infrastructure Condition Assessment

ENSCO Rail is an international leader in railway measurement and inspection technologies. A pioneer in the industry, we've designed track inspection cars capable of integrating and synchronising a large network of sensors to comprehensively evaluate infrastructure conditions. ENSCO Rail inspection cars offer the most accurate sensor technology and advanced software processing and reporting available to ensure infrastructure safety, increase efficiency of inspection operations, and reduce operating costs through precision maintenance planning.

ENSCO Rail offers a broad range of vehicle inspection platforms to meet the unique needs of our customers:

- **Comprehensive Manned Inspection Vehicle**
- **Railbound or Hi-rail Available**
- **Self-propelled or Towed Coach Option**
- **Diesel or Electric Powered**

#### Measurement Systems

- **Track Geometry**
- **Rail Wear**
- **Clearance and Ballast Profile**
- **Overhead Wire**
- **Power Rail**
- **Rail Corrugation**
- **Ultrasonic Rail Flaw**
- **Gage Restraint Measurement**
- **Ride Quality**

**Vision and Imaging Systems**

- **Driver View Imaging**
- **Track View Imaging**
- **Overhead Wire Imaging**
- **Power Rail Imaging**
- **Thermal Imaging**
- **Track Component Imaging**
- **Fishplate Imaging**
- **Rail Surface Imaging**

## Increased Safety at Lower Operational Costs

ENSCO Rail is a pioneer in the development of autonomous track measurement and inspection systems that provide reliable, fully autonomous inspection installed on passenger or freight cars used in revenue service. These systems offer a key advantage over traditional manned systems in that they operate uninterruptedly, more frequently, and without an operator on board.

ENSCO autonomous systems offer a cost-effective approach for maintenance planning and railway standards compliance:

- **Autonomous Track Geometry and Rail Wear – measures and reports track geometry and rail wear exceptions, including gauge, crosslevel, warp, twist, surface, and alignment**

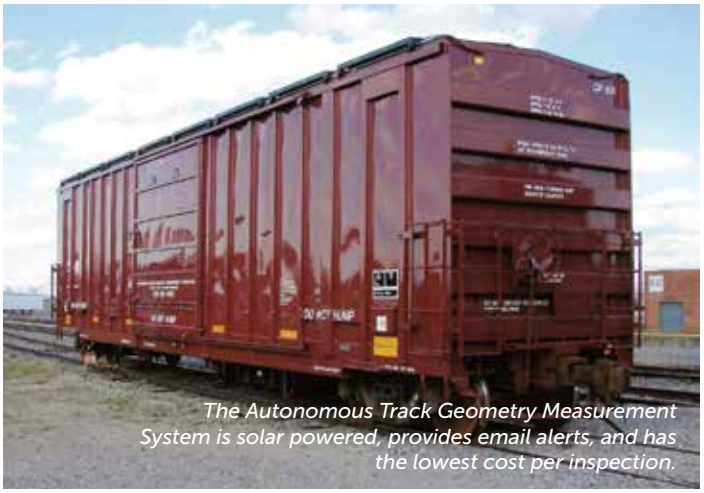
- **Autonomous Vehicle/Track Interaction Monitoring – measures ride quality, wheel/rail impacts, and short-chord track surface conditions**

## Fully Integrated Data Management and Analysis Software

ENSCO's proven inspection technologies are complemented with advanced office and web-based enterprise data management analysis and maintenance planning software. Our Data Management Suite provides a fully integrated offering of data management and analysis software packages. Built on a common architecture, data structures, and asset databases, the software seamlessly integrates into one user interface and enables cross-communication of the systems.

The ENSCO Rail Data Management and Maintenance Planning Suite offers the following functionalities:

- **Regulatory Compliance and Reporting for Track Inspections**
- **Automated Inspection Data Management**
- **Condition Monitoring**



*The Autonomous Track Geometry Measurement System is solar powered, provides email alerts, and has the lowest cost per inspection.*

- **Spot and Program Maintenance Planning**
- **ERP Integration**

## ENSCO Rail: Experienced. Patented Technology. Excellent Support. ISO Certified.

ENSCO Rail track inspection solutions are currently in operation on more than 30 dedicated inspection cars, 25 road-rail trucks, and 450 revenue cars throughout the world. Our inspection technologies are used across a broad base of railway gauges and operations, including freight, mines, high-speed rail, and passenger transit/metros.

## About ENSCO Rail, Inc.

A wholly owned subsidiary of ENSCO, Inc.
For more than 45 years, ENSCO has been leading the rail industry worldwide in developing new and advanced technologies to improve the safety, security and quality of their operations. ENSCO is a leading provider of automated and autonomous inspection systems, web-based data management systems, vehicle dynamics analysis and simulations, and large-scale systems integration for federal and commercial railways. The ENSCO name represents the rail industry's premier source for track inspection, vehicle/track interaction monitoring, railroad asset management technology, and PTC/train control inspection and services. The ENSCO Rail subsidiary provides the products and services to commercial customers. **www.enscorail.com**

## Learn more about ENSCO Rail solutions in Hall 25 Stand 318 at InnoTrans 2018!

# Hydrogen Cells: How Alstom is Building on the Coradia iLint

## One of the most effective selling points of rail transport, for both passengers and freight, is the lower impact on the environment in comparison with other types of transport.

*The capacity for carrying large numbers of people and cargo in a single unit is a major aspect of this, but as governments around the world commit to phasing out diesel before 2050, the fuel which powers the engines of trains has become something the industry must look at. Electric and bi-mode trains are the preferred solution to this question of sustainability. However, these options have some disadvantages so TOCs and suppliers are looking for alternatives. In response to this debate Alstom Transport has successfully designed and built a train powered by hydrogen cells. After having been presented at InnoTrans 2016, the Coradia iLint was successfully tested in Germany during 2017 and in 2018 received federal approval for passenger services in Lower Saxony. These developments have attracted the attention of other operators and in 2018 the company announced an agreement with Eversholt Rail to introduce a train powered by hydrogen cells to the UK. Alstom will convert the Class 321 electric multiple units in the rolling stock operating company's portfolio to hydrogen power. The option to convert existing trains to this source of power instead of buying a new model is significant because making the technology more accessible and affordable is a prerequisite for the proliferation of it in the future.*

*Class 321 EMU*
*© Hugh Llewelyn (CC BY-SA 2.0)*

**Mike Muldoon, Head of Business Development at Alstom UK and Ireland, told Railway-News more about this project:**

Alstom has been at the forefront of innovation in the rail industry for decades, delivering high-speed rail travel, setting the benchmark in terms of passenger experience and today at the forefront of the digital rail revolution. We're proud of our record of bringing the latest technologies to market to deliver sustainable mobility solutions. It is crucial that we continue to help the industry adapt and modernise.

With the government having set its sights on 2040 as a deadline by which to decarbonise rail travel, it should therefore come as no surprise that Alstom is leading the charge by bringing hydrogen rail to the UK as a viable alternative to diesel or electrification schemes.

The potential for hydrogen trains is enormous. Nearly a third of all trains in the UK run on diesel, and current levels of emissions are unsustainable and damaging to our environment and health. A particular area of concern to all should be the level of emissions found at railway stations, and the RSSB is currently studying the


concentration of nitrogen dioxide and particulates at London King's Cross and Edinburgh Waverley stations.

The government recognises the need to innovate across the rail industry and develop zero-carbon, sustainable alternatives. The Rail Minister, Jo Johnson, deserves great credit for his challenge earlier this year to the UK rail industry to decarbonise and eliminate diesel-only trains across the next twenty years.

Alstom is already a world leader in sustainable mobility and our award-winning Coradia iLint, the only operational hydrogen train in the world, will shortly be entering regular service in Lower Saxony in Germany. It uses fuel cells which produce electricity by combining hydrogen and oxygen, and the only output is water. The Coradia iLint is a milestone development in the future of rail travel and, alongside mainline electrification, provides passengers with a smoother, quieter and cleaner journey.

We plan to build on our success in Germany by bringing hydrogen rail technology to the UK. In May of this year, we announced our plans, working with Eversholt Rail, to convert Class 321 EMUs to hydrogen operation – upcycling this fleet to be one of Britain's most advanced types of rolling stock. This will bring skilled jobs to our facility at Widnes, the most sophisticated centre for train modernisation in the UK.

The Class 321 trains that currently run on the Greater Anglia franchise will be converted to hydrogen. The first trains could be ready to enter service as early as 2021–22.

The converted hydrogen trains will have the same or enhanced performance as typical regional DMUs and will be designed to meet operator requirements. They will be quiet and smooth when in operation, benefitting both the passengers and neighbours of the routes they serve.

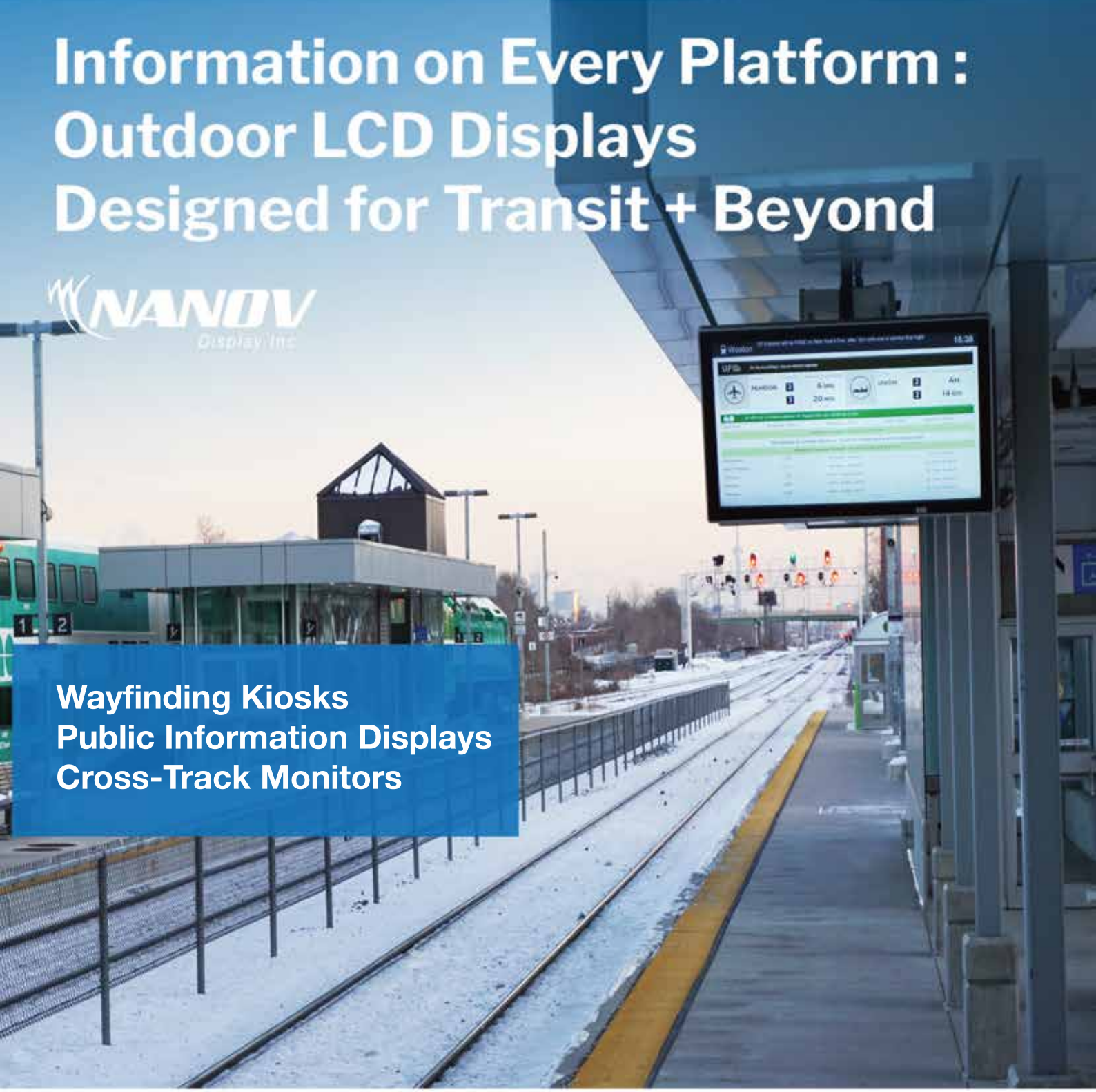
Converting these Class 321s is just the first step. Across the country, there are a number of routes where electrification might be difficult or not cost-effective, and so providing hydrogen trains as an alternative is a clear solution to the need for zero-emission transport. The proposed route between Oxford and Cambridge is just one of many that could benefit from hydrogen technology.

Our announcement was the first substantive industry response to the government's challenge to the industry made back in February. We've fired the starting gun and have the ambition and experience to lead the industry on this exciting path towards a cleaner, greener future.

*Additional writing by Zoe Cunningham.*

# Information on Every Platform : Outdoor LCD Displays Designed for Transit + Beyond

NANOV Display Inc



**Wayfinding Kiosks**
**Public Information Displays**
**Cross-Track Monitors**

NANOV Display is a manufacturer of custom-designed, outdoor LCD displays – leading the way with cutting-edge technology, designed to fit any outdoor, commercial or transit setting. NANOV produces robust, digital LCD monitors and exterior signage that can withstand a myriad of environmental challenges: Nanov's IP65 sealed marine monitors have withstood hurricane-strength winds, humidity, and salt-water erosion in the oceans of Miami, Florida; Nanov's weatherproof digital signage monitors have overcome difficulties brought on by the severe cold and extreme weather conditions of Toronto, Ontario. From IP65-tested, fully-sealed enclosures and vibration-resistant monitors with WiFi modules, to Interactive, Wayfinding Digital Kiosks, NANOV delivers high-precision, enduring industrial design, remote maintenance, and excellent customer service throughout the world.

**www.nanov.info**

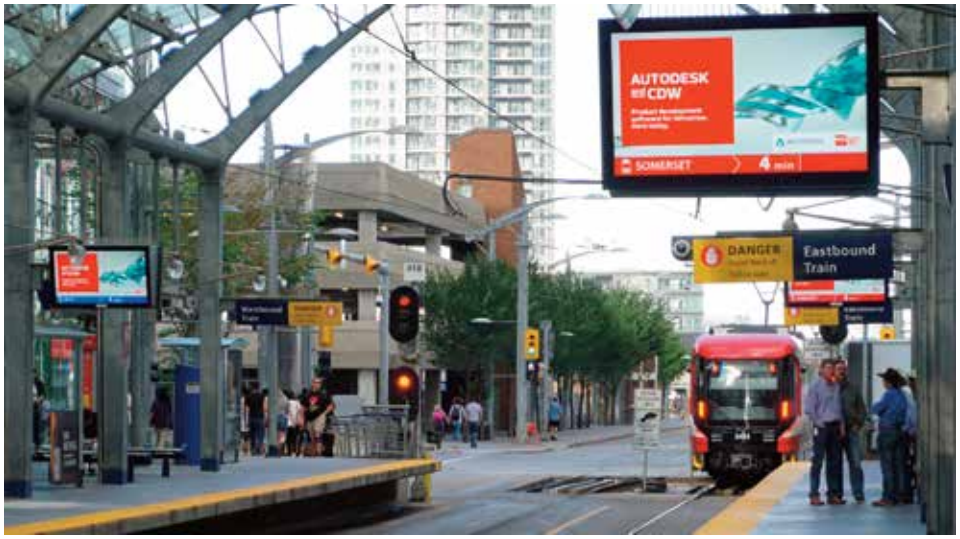
**Visit us at InnoTrans 2018 at Hall 9 - Stand 616**

# Nanov Display, Inc.

## Nanov Display, Inc. has recently unveiled the latest in its line of cutting-edge (PIDS) Passenger Information Transit Displays, designed for the outdoors.

Nanov Display, Inc. has recently unveiled the latest in its line of cutting-edge Passenger Information Transit Displays (PIDS), designed for the outdoors. With LCD products ranging from 75" Interactive Kiosks to 55" Stretched Transit Monitors, the line includes new models abundant with interactive features, built to endure the hazards of the outdoors and the changing climate. This year, with MSC-Technologies and AVNet Europe, the company has been expanding into the European market. Based in Miami, Florida, Nanov Display, Inc. started in 1999, specialising in sealed marine monitors, built to be impervious to saltwater erosion. The company has since grown to be a globally-recognised LCD hardware manufacturer of Information Displays and Kiosks with products placed in media and transit settings around the world.

NANOV produces robust, outdoor LCD monitors and exterior signage that can withstand a myriad of environmental challenges: their IP65 sealed monitors have endured the effects of brutally cold winters and blizzards of Toronto, Ontario. Nanov Display has cross-track digital displays in train stations in Edmonton, Alberta, and in Oslo, Norway, where they have withstood challenges posed by incessant train vibrations, dust accumulation, and train-related wind loads. This past September, Nanov Display's outdoor digital signage was tested to the limits – as Hurricane Irma stormed through Miami Bayside in South Florida – and proved resilient to the stormy South Floridian climate.




In cities across the nation, Smart Cities Interactive Kiosks are beginning to light up sidewalks and urban spaces – acting as technological connective tissue that creates safer, smarter urban environments. From emergency phones to phone chargers, free Wi-Fi, embedded analytic cameras, up-to-the-minute real-time transit scheduling, news, and advertising, NANOV's Citypost Smart City kiosks have it all. Engineered alongside IoT tech specialists, Smart Media, LLC, these outdoor, interactive LCD kiosks have been installed in cities like Little Rock, Arkansas; Louisville, Kentucky; Memphis, Tennessee; Kansas City, Missouri; and Newark, New Jersey, where they can function as multi-purpose interactive centres for pedestrians and cities alike, displaying an array of transit options, tourist attractions, restaurants, and local media.

Nanov Display's most recent 55"

Double-Sided Kiosk model can be found in Miami – built for the outdoors, featuring an interactive touchscreen on each side. With integrated multiple IP Cameras, 360° surveillance and security are available via internet, as well as public-facing cameras for selfies, analytics and kiosk interaction. Additionally, a NAVpad expands ease of access for pedestrians with disabilities.

Nanov Display's latest models run the full gamut between these 55" Smart City Kiosks, 46" fully-sealed Transit PIDS Monitors, and 84" Outdoor Media Displays specifically designed for bus stations and the outdoors. Other exciting additions are the 46" and 55" Stretched Transit Monitors designed to bring information to passengers throughout transit, featuring data sent in real-time via an embedded computer, an entirely weather-proof IP-65 certified, fully-sealed LCD, with a front-opening mechanism for easily accessible maintenance. These monitors can be found in either their single or double-sided forms in bus stops throughout Montgomery County, the Bloor Station in Toronto, among other locales.

NANOV's latest innovation is a PID Transit Monitor model – LANDSCAPE IP65. It will be introduced at InnoTrans 2018 in Berlin, Germany. Through engineering breakthroughs, the monitor can be mounted on the ceiling, as well as via an arm mount from platform poles or walls. At a 10º angle, this tilted display is more readily legible for passing pedestrians, and is built with heavy-duty strength mount holes and brackets to securely hold more than 150kg. This model was designed for the outdoors, ideal for train stations and bus stops. NANOV LCD screens display full clarity even under the harshest direct sunlight and are weather-proof for a variety of challenging climates. With tamper-proof, wind-resistant tempered glass, these monitors are impervious to social and climate hazards, and are fully protected by and encased in a powdered-steel enclosure.

Last month, Nanov Display received the official UL48 certification – indoor/outdoor use – for their LCD outdoor, electric signage. UL is a global safety consulting and certification company, renowned for product testing and safety analysis of new technology. The UL48 evaluation involves a rigorous waterproof test (4-hour water shower), a construction test (for resilience against corrosion, mechanical electrical disconnections, and damage to sealant), an electrical test (checking the circuit breaker, grounding, terminal block, Class 2 circuit, and wiring), among other testing.

Additionally, all NANOV products have the option of including one of various embedded industrial computers, as well as a built-in remote maintenance module with an extensive hardware health-monitoring system. The remote maintenance module eliminates transit delays caused by manual repairs, allowing for easy fixes handled from a distance, and peace of mind. The module is connected to a monitoring interface with real-time data that shows the status of the hardware via Ethernet and provides extensive control entirely from a distance. With this, hardware can be powered on or off remotely, and has been equipped with ambiance sensors with the ability to control brightness, fan speed, and internal thermoregulation. Furthermore, each monitor is embedded with a feature that can alert management within seconds whenever the screen stops displaying content, using sensors that detect pixel movement.

Every PIDS Kiosk and Monitor is carefully designed for the context – whether that's challenging weather, a transit setting, specific media requirements, or the difficulties of the outdoors.

With remote maintenance modules, embedded computers, and highly-customisable design – shaped to each specific context and climate – Nanov Display leads the way in all-weather, digital displays meant for the outdoors, transit, and beyond.

Our website is **www.nanovdisplay.com** and please contact us at **info@nanovdisplay.com** for any questions or product information. You can also come and visit us at **InnoTrans** in **Hall 9 Stand 616.**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# Interlocking for Safety of Personnel and Equipment

## The Cost of a Workplace Fatality

Health and Safety Executive (HSE) statistics for 2017/2018 revealed that 144 people were fatally injured in UK workplaces. It is difficult to obtain a precise figure of the cost of any one such fatality, but when considering the cost of legal proceedings, medical and emergency services charges, damage to equipment as a result of the fatality, loss of production, insurance costs and an unquantifiable cost of human grief and suffering, then a figure between £2–7 million is not unreasonable. This cost is crippling to all but a few large organisations, so it is vital that everything possible is done to reduce such a risk in the workplace.


High-voltage equipment, heavy machinery and moving vehicles make it undeniable that rail yards and depots are high-risk environments to work in. In 2016, the Office of Rail and Road (ORR) Annual Health and Safety Report stated that overall harm at yards, depots and sidings was at its lowest level since consistent recording began in 2007–08, but that there is still more to be done. The report detailed how their investigation found depots to have an inconsistent approach to managing risk to the workforce. Whilst some had a strong approach to staff safety other depots were reported to have developed their own individual safety culture, which was described as poor with only ad hoc risk control arrangements.

Many injuries and fatalities can be avoided if prescribed safety procedures are followed. Unfortunately, human error is

inevitable and most procedural systems fail to recognise the human element. However, an engineered solution to protect rail depot staff from exposure to high voltages is at hand in the form of system interlocking.

## Interlocking in Train Depots

Zonegreen have developed highly sophisticated interlocking systems in train depots that prevent unauthorised movements of trains. This protects personnel from injury or death, and also helps avoid damage to other trains and equipment in the depot. Zonegreen are generally acknowledged as global market leaders and have installed their Depot Personnel Protection System (DPPSTM) in numerous depots throughout the UK, Ireland, Australasia and the Middle East. Additionally, they manufacture interlocking systems that prevent personnel and depot equipment from coming into contact with overhead lines (OLE).

Zonegreen have developed a safe system of work that absolutely prevents access to high-level access platforms by means of a fully guarded stairway and interlocked gate that can only be opened with a key that is released from a control panel when the OLE is isolated and earthed. The sequence of unlocking and removing keys that in turn allows other keys to be released ensures prohibition of access to areas unless they are safely isolated and earthed. It is also possible to monitor the position of the gate locks to ensure that they are all closed and locked prior to enabling the re-energisation of the OLE.

In addition, a series of green lights can be provided that light up above the roads that are isolated, earthed and interlocked, providing a visual indication of when it is safe to work. This interlocking system is vastly superior to a 'permit to work' system that is only reliable provided that everyone in the loop continually follows procedure.


Further refinements to the basic interlocking system can be made to ensure the safe placing and removal of earth loops on overhead wires. Failure to remove all earth loops before re-energising the OLE has, in the past, caused numerous incidents with subsequent injury to personnel and serious damage to plant and equipment. Other hazards that can be eliminated are the bridging of live and earthed OLE by trains having two pantographs, also problems associated with 750 DC suburban rolling stock having multiple pick up shoes along the length of the train. In addition, depot equipment such as cranes and pressure washers, which have the potential to come into contact with the OLE, can be interlocked to inhibit their operation whilst the OLE is live.

## The Future

Whilst many new UK depots including the Thameslink, IEP and Crossrail maintenance facilities benefit from the technology described above – technology that has contributed to the fall in recorded injuries and fatalities – there are still many maintenance depots that have room for improvement as identified by the ORR report. In order for all staff to be in a safe working environment, it is essential that a consistent approach to protecting the workforce from human error and failings of manual 'permit to work' systems is adopted across all rail depots. Zonegreen's DPPSTM can be developed to encompass both electronic and mechanical interlocking which is intuitive, user friendly and provides proven protection against accidents and fatalities.

To find out more about Zonegreen's wide range of depot safety products, telephone **(0114) 230 0822** or visit **www.zonegreen.co.uk**

# Protecting your depot's most valuable assets

## Zonegreen's SMART DPPS™

### Give your rail depot workforce the confidence to work safely & effectively.

Even with all of the expensive infrastructure and equipment present in modern railway depots, the most valuable element of any rail facility will always be its workforce. Zonegreen's SMART Depot Personnel Protection System (DPPS™) protects workers by safely and efficiently controlling train movements within depots.

By far the market leader, Zonegreen's DPPS™ has an unrivalled reputation as the most advanced, high-quality, reliable, proven and widely-installed product of its kind, with installations both across the UK and around the world. The company boasts unparalleled expertise and experience in depot protection systems and employs an array of highly-skilled specialist engineering staff. Zonegreen is also an experienced and trusted provider of depot interlocking solutions.

zonegreen
safe working solutions


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# Trends and Drivers in Fail-Safe Architectures for Rail Systems

The market for embedded computing technologies in rail applications is following a similar trend as has been seen in other embedded market spaces.

A layer of the technology value chain becomes 'table stakes' – delivering limited competitive advantage to a point that it makes sense for application providers to reallocate R&D resources to differentiating elements of the end product and buy the base technology from companies who are dedicated to that technology. We are witnessing this transition in the rail market for embedded computers that are certified to safety integrity level four (SIL4), the highest level. These embedded computers offer a certified, commercial off-the-shelf (COTS) generic fail-safe platform, allowing rail application developers to focus their R&D resources on differentiating applications.


A few major factors are the root cause for the emerging trend to outsource SIL4-certified application platforms:

**1.** **The lack of SIL4 development expertise by some rail application providers and the barrier that poses to aspirations to expand into overseas markets.**

**2.** **The threat to Western vendors posed by the entry of Asian vendors into the global rail market and the price erosion that would likely bring (witness the impact Huawei had on the global telecoms market).**

**3.** **The prevalent architecture implemented by existing fail-safe computers is no longer capable of handling the required performance, requiring an expensive development effort in 'table stakes' base technology.**

## Lockstep Architectures

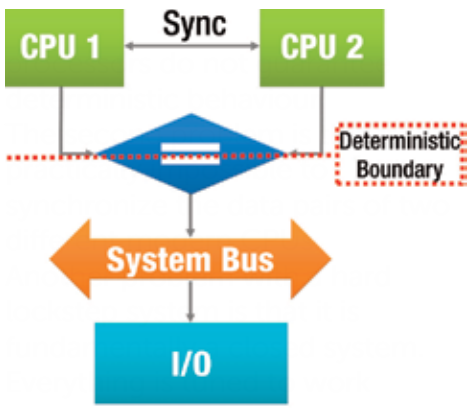
Most rail systems today use an architecture called hard lockstep, whereby two processors execute the same instruction at the same time and drive their respective

address and data buses in synchronization.

Comparison is performed at the address and data bits of the processors, so a primary and mandatory requirement is that the two processors must execute the same instruction, at the same time, to the same external resources (memory, cache, I/O, etc.). To do so, the processors themselves must be deterministic. We call the boundary created by the comparators the deterministic boundary.

Unfortunately, hard lockstep cannot be implemented using modern processors.

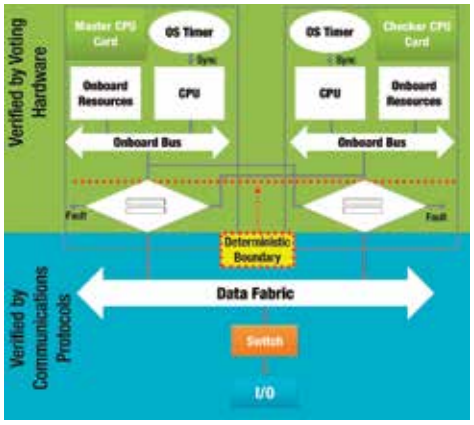
The first problem is that modern



together, and it has to be all synchronized such that it's very difficult to upgrade technologies without affecting the total system. So the bottom line is that hard lockstep is just not possible anymore with advanced processors.

Artesyn has developed an alternative approach we call **data lockstep architecture**, whereby a deterministic boundary is created at the output stage of the processor board to the system data fabric that connects the processors to external devices. Before the processor boards are allowed to change the state of external equipment by driving packets on the data fabric their packets are compared to ensure that they are the same. If they are the same, then the transaction is forwarded to external equipment; if the packets do not compare, then a failure is declared, and the system fails safe; i.e., it is prevented from changing the state of external equipment.

As shown in the figure below, the deterministic boundary is not at the processor itself but rather at the edge of the processor and before packets are placed on the data fabric.




The benefit of data lockstep is that it makes it possible to use modern processors and deliver the performance required by modern rail applications.

## ControlSafe Architecture Highlights

Artesyn has over 30 years of experience serving a range of fail-safe and fault-tolerant industries, including the world's telecommunications networks, where we have deployed hundreds of thousands of products.

Artesyn's ControlSafe portfolio includes the ControlSafe Platform, ControlSafe Expansion Box Platform, ControlSafe Carborne Platform and ControlSafe Compact Carborne Platform. The first three platforms in the portfolio have been certified to SIL4, while SIL4 certification of the ControlSafe Compact Carborne Platform is planned. The ControlSafe Platforms are a cost-effective, modular and scalable system that is based on open industry standards. The systems are future-proof and provide protection for the customer's investment because the architecture enables upgrades to both the CPUs and the I/O modules independently of each other.

This portfolio is designed to offer COTS SIL4-certified platforms, bringing to customers all the benefits of outsourcing table-stake technology – accelerated time to market, significant savings in R&D and certification costs, and the ability to focus their effort and their R&D on differentiations from their competitors.

One customer that is developing a next generation computer-based interlocking (CBI) system based on Artesyn's ControlSafe Platform said, "we can significantly reduce the costs and risks of the SIL4 system development and certification process, saving potentially millions of dollars and many years".

## For more information:

Tel: **+1 (888) 412-7832**
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# ControlSafe™ Platforms

## SIL4 COTS Fail-Safe Systems for Train Control and Rail Signaling

- SIL4 COTS fail-safe & fault-tolerant system
- Data lock-step architecture
- Hardware-based voting mechanism
- Rolling stock & trackside deployment
- 25 years support & service
- Global service organisation

Leveraging over 30 years of expertise in developing highly reliable and available embedded computer systems, Artesyn Embedded Technologies is a premier supplier of commercial off-the-shelf (COTS) fail-safe computer systems to rail system integrators and rail application providers.

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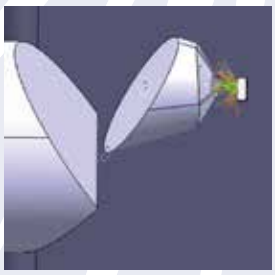

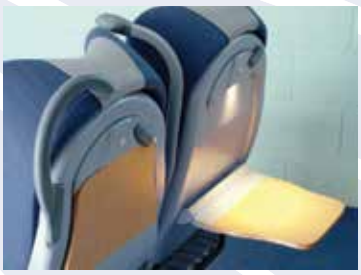

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# Rolling Stock Highlights – Part 2

## at InnoTrans 2018

*By Josephine Cordero Sapién*

### Electric Multiple Units

- **ÖBB: Cityjet TALENT 3 (Outdoor Display 8/400):**
**Manufactured by Bombardier**

**Highlight:** seasonal bike storage
This six-part EMU, manufactured for ÖBB to run in the Austrian state of Vorarlberg as well as neighbouring countries such as Italy, Switzerland and Hungary starting in 2019 has been very well thought through. One of its main features for passengers is that it comes in two seasonal versions – a summer configuration, which features increased bicycle space (up to 53) and a winter configuration with more seating and storage for snowboards and skis. In fact, the summer configuration will contain an entire carriage just for bicycles. ÖBB requested that Bombardier fit bike racks in this carriage that did not just grip the front wheel as this can cause damage.

In total the Cityjet TALENT 3 will be 104.5m in length with seating for 304 people in winter and 276 in summer. Austria has seen a great increase in rail use and as such there has been a trend towards longer trains with more seating in regional trains. These Cityjet TALENT 3 units will be the longest electric multiple unit in the Austrian Federal Railways fleet. One feature the TALENT 3 is capable of is that it can be combined with Bombardier's PRIMOVE lithium-ion battery system so that non-electrified sections of track can be bridged without having to resort to diesel fuel. This system will not be installed in the Cityjet EMUs but can easily be retrofitted if operators wish. The first TALENT 3 that will run using this battery system will be in southern Germany. At InnoTrans 2016 Bombardier was handed a letter of intent for innovation funding worth four million euros by the German transport minister Alexander Dobrindt to support the development of the TALENT 3 equipped with the PRIMOVE battery.

The TALENT 3 is also fitted with ETCS and has been approved for operation across Europe, thanks to its compliance with TSI and EN regulations.

*ÖBB Cityjet TALENT 3 © Bombardier*



- **Rhine-Ruhr Express (Outdoor Display 2/400)**
  **Manufactured by Siemens**

**Highlight:** innovative window coatings for better phone signals

The Rhine-Ruhr Express (RRX) is a set of works to improve the rail network in Germany's busy Rhineland and Ruhr Area regions centring around the cities of Cologne, Dortmund, Duisburg, Essen, Dusseldorf, Bonn and Koblenz. As part of these upgrade works, the relevant transit associations – Rhine-Ruhr (VRR), Rhineland (NVR), Westphalia-Lippe (NWL), Rhineland Palatinate North (SPNV-Nord) and North Hesse (NVV) – Siemens was awarded a contract to deliver 82 trains along with a maintenance contract for the full 32-year intended operating cycle of the fleet.

The first eleven RRX trains will enter service gradually when the new timetable is introduced in December 2018. Initial services will begin on the RE11 route between Dusseldorf and Kassel, which will be operated by Abellio Rail NRW. The other operator participating in the RRX route network is National Express Rail.

Based on Siemens's Desiro trains, one of the key features of these new Desiro HC EMUs is their windows: not only are they large, allowing in a lot of light and providing passengers with an exceptional view, they will also boast a frequency-selective window coating – a world first – in order to improve phone reception by up to 50 times. The problem with regular windows is that they reflect all kind of electro-magnetic waves. According to Siemens this causes the carriage to act like a Faraday cage, and in high-speed trains this effect reaches 99.9%.

Another feature is that the Desiro HC will combine double and single-deck cars, with each multiple units consisting of four cars. The two end cars will be single-deck, while the two middle ones will be double-deck. The total length of these RRX trains will be 105m and have a seating capacity of 400. The RRX trains will be able to reach their top speed of 160km/h very quickly, which the RRX project director at Siemens says will make it easier for the trains to keep to the timetable.

# Bi-mode Multiple Unit

- **FLIRT BMU for Greater Anglia (UK; Outdoor Display 10/410)**

**Manufactured by Stadler**

**Highlight:** the bi-mode drive

Just after InnoTrans 2016 Stadler won its biggest contract in the United Kingdom to date, to supply 14 three-car and 24 four-car bi-mode FLIRT trains (Class 755 – bi-mode) as well as 20 twelve-car electric multiple units. The three-car units will have seating for 167 and the four-car units for 229 passengers. Overall, Greater Anglia will increase its seating capacity by 20%. These trains will replace the older rolling stock servicing Greater Anglia's regional and intercity routes as well as its Stansted Express fleet (Class 745 – electric). They are being built in Bussnang, Switzerland but will be maintained in England.

The bi-mode nature of these trains is an innovative solution, allowing rolling stock to operate smoothly on lines that are not fully electrified yet or where it is impractical to do so. A bi-mode option is more environmentally friendly than a fully diesel-powered train. The train can operate either in electric mode or in diesel/electric mode; the diesel engines fitted on these trains are quiet and meet the stringent IIIB (US EPA Interim Tier 4) standards for emissions.

Delivery of these 58 trains will begin in 2019. Energy produced while braking under an electric overhead line is fed back into the overhead wires for use by other trains.

Stadler will give a presentation of its FLIRT BMU at the Outdoor Display 10/410 on 20 September at 3pm.


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# Environmental Cost of Ownership

## Rugged vs. Consumer Devices


Mobile computers are continuing to improve efficiency, safety and customer service in public transportation. And beyond fare enforcement and passenger services, mobile computers are common in train yard work, inventory management, signalling and workforce management.

Choosing the right type of mobile device for the job can be challenging. Should you go with a truly rugged computer, or a consumer type device and put it in a protective case?

A mobile computer that's rugged and built to last doesn't only save you money when looking at the total cost of ownership — it also helps reduce harmful electronic waste.

### Selecting a mobile computer

There are many criteria to consider when deciding which mobile device to buy. How expensive is it? Does it have the tools and features you need? Will it be reliable for your work? Is it easy to use?

But beyond form and features, another factor is quickly moving up the list of priorities for today's businesses: does this choice support our commitment to social responsibility?

### The e-waste dilemma

As technology advances, electronic devices are becoming more affordable, and device life-cycles are becoming shorter and shorter. This is due in part to cheaply made equipment that isn't designed to last more than a couple of years, as well as to consumers' desire to upgrade technologies as soon as new devices are released. To meet the demand for newer, faster and sleeker devices, some companies release upgrades at a frenetic pace.
But frequent device turnover comes at a cost.

People are producing more electronic waste than ever before — and the numbers keep increasing every year. Global e-waste for 2016 amounted to 44.7 million metric tons, equivalent to almost 4,500 Eiffel Towers, according to The Global E-waste Monitor. And despite many manufacturers offering recycling

services and incentives, only 20% of global e-waste is documented to be collected and recycled.

## Caring for future generations

Corporate Social Responsibility (CSR) is more than a buzzword — it refers to the belief that it is a company's duty to care for all stakeholders connected to or impacted by its operations. As the world becomes increasingly connected through technology, more and more companies are recognizing their responsibility to address and rectify the way their use of technology contributes to the problem of global electronic waste.

Emerging technologies have made amazing contributions to our world, allowing increased connectedness, innovation and efficiency. Product and software developers are working on new solutions every day that improve the way people care for the earth and one another. But as we recognize the advantages of our rapidly changing world, it's also essential to be aware of the problematic aspects of viewing technology as disposable. Reducing waste by choosing products with longer life expectancy is one very simple way companies can do their part to make sure future generations enjoy the benefits of technology more than they have to contend with its harmful side effects.

## Environmental Cost of Ownership

Total cost of ownership (TCO) refers to the idea that a higher upfront investment in a product that's built to last actually results in significant cost savings over the product's lifespan.


We would like to assert that the **environmental cost of ownership (ECO) is an equally important factor to consider when choosing electronic devices for your company.**

The good news is that ECO and TCO work hand in hand: when you choose a rugged mobile computer over a consumer device, you not only save money — you also reduce the amount of e-waste your company produces.

## Environmental impact of consumer vs. rugged devices

A VDC Research report found that during the first year of deployment, average failure rates for rugged devices ranged from 4% to 7%, while failure rates for non-rugged devices ranged from 10% to 23%. Additionally, failure rates decreased for rugged devices between VDC's previous research and the cited study, but increased for non-rugged devices. Rugged devices fail less often, and therefore are disposed of less often. Choosing rugged handhelds for your team keeps more electronics out of landfills and reduces your company's environmental impact.

## So, how do I choose low-ECO products?

The answers to two main questions can help determine a product's Environmental Cost of Ownership:

**1. The durability question:** Will this device break easily under the conditions in which I plan to use it? Is it built to last, or will it need to be replaced within a year or two?

**2. The reparability question:** If this device does break or experience any issues, can it be easily serviced or fixed?

## Handheld devices are built to last

Every mobile device manufactured by Handheld meets high standards for ruggedness. Our customer solutions are excellent examples of how our ultra-rugged computers, tablets and smartphones have proved reliable in a huge variety of work environments.

**Our devices are both durable and repairable.** They easily last a


*this article is supplied by Handheld Group*

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full 3- to 5-year lifecycle, and some of our customers keep using them for up to 7 years before replacement. They are built from the inside out to withstand repeated drops, water and dust exposure, extreme temperatures and other challenges.

On the rare occasion that a Handheld device has an issue, we'll have a solution. We carry spare parts longer than non-rugged brands, and we offer extended warranty options for our already long-lasting products to extend their lives even further. Unlike many consumer device companies, we also offer user-replaceable batteries.

**The decision to equip your team with rugged mobile computers is a decision made with regard for both the future of your business and the future of the environment**.

## No matter which device you choose, please recycle it!

For information about how to responsibly recycle devices at their end of life, visit https://www.consumerreports.org/recycling/how-to-recycle-electronics/

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## PROSE is an independently-owned mobility solutions provider, specialising in rolling stock engineering.

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Being based in different countries means our team is made up of the best experts in our field, without any geographical restrictions. Therefore, our teams gain considerable international experience in very specific areas through our work in different countries.



As our customer, you have full access to PROSE's international pool of experts. You can benefit from our local and international experience.

**Our services cover the whole vehicle life-cycle:**

- **Planning** – Operating rolling stock is a capital-intensive business, which should have a long-term focus. We can provide you with all relevant long-term information for your daily decisions from overall rolling stock strategy, asset analysis, to vehicle concepts and trend studies.

- **Procurement** – Procuring rolling stock is extremely complex and absorbs time and resources. From specification assessment and tender preparation, through bid evaluation, to negotiations support – we can assume total responsibility for your project or bolster your existing team.

- **Development** – Developing solutions that integrate all relevant technical, safety and comfort related requirements, with no need for re-adjustments to manufacture can be tremendously demanding. From conceptual to detailed design – we develop your new rolling stock from A to Z. We develop bogies, running gears, car bodies, driver's cabin, interiors, components, and overall system integration – ready to manufacture.

- **Manufacture** – Failure to supervise manufacturing and assembly processes can lead to faults, scheduling problems and cost overruns. We supervise fabrication and assembly and co-ordinate all manufacturing phases among all involved parties.

- **Homologation** – Obtaining homologation for new rail vehicles from authorities requires extensive stationary and on-track tests to verify safety and passenger comfort. As an accredited test laboratory, we can perform the necessary measurements and tests. We can assume responsibility to lead your rolling stock into operation.

- **Operation & Maintenance** – The ever-increasing pressure on costs, leads to the need of continuous improvement processes to reduce vehicle failure and minimise required reserves. We support you in troubleshooting and maintenance optimisation of your vehicle.

- **Modernisation** – Even if older rolling stock has been well-maintained, it may not fulfil current standards. Although often cheaper than buying new vehicles, updating existing ones can be challenging. From plan definition, through measures supervision, to the homologation of your modernised vehicles – we help you keep tight deadlines, budgets and strict technical requirements under control.

## Take a journey through the vehicle life-cycle
## We are with you all along the way!

**At our stand you can go on a journey through the different phases of the vehicle life-cycle. As you travel along the different stations, we will show you how we can support you in successfully overcoming challenges which might be encountered during planning, procurement, development, manufacture, homologation, operation, maintenance or modernisation of your vehicles.**

You will find us in **Hall 2.2** at **Stand 207**. Our stand will have interactive points through which you can have a deeper look at our project portfolio, the technology we use as well as the services we offer. Our team of experts will be there to welcome you, discuss your needs and help you find the right mobility solution.

On our website **www.prose.one**, you can book a meeting with one of our specialists or request an entry ticket to meet us at InnoTrans.

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# LORAM® at InnoTrans 2018:

## Maintenance of Way in the USA Pavilion

American maintenance of way company Loram is proud to be an exhibitor at this year's InnoTrans 2018, as part of the USA Pavilion. Located in Hall 22b, the railway infrastructure section of Hall 22, Loram will occupy Booth 8–9 of Stand 310. The USA Pavilion is hosted by REMSA, the Railway Engineering Maintenance Suppliers Association, for the exclusive use of US-based railway suppliers. Beneficially, translators will be on hand to make all communications and enquiries effortless.

Established in 1954, this global leader in its field is sending world-class engineers and designers to InnoTrans 2018 to showcase the advances in their equipment and technology for the rail industry. Loram sells and leases its machines but primarily prides itself on its work as a contractor, providing maintenance services to all sectors of the rail industry – passenger, freight and transit.

Loram is committed to delivering superior value and ensuring continuous improvements in the design, build, operation and maintenance of its entire product portfolio. Products and services include production and speciality rail grinding, ditch cleaning, shoulder ballast cleaning, undercutting, rail handling, track lifting, friction management and data services serving heavy haul, international, speciality and transit railroads.

Visitors to the Loram booth will also have an opportunity to meet with a representative of its subsidiary companies, GREX, SENSR or HyGround, all in one location.


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# Next Generation Power Stack Technology

The requirement for higher rating per unit cost and higher availability for power converters are driving interest in new materials such as SiC. Amantys is developing a range of techniques that allow more performance to be gained from existing Si technologies that are also applicable to future SiC-based converters.

## Introduction

Power stack designers have the task of designing a cost-optimal power converter within the constraints of today's technology. The nature of designing high-power converters requires the design to use high design margins as the risk of failure is high.

Amantys has developed a range of techniques that enable the power stack designer to be more intelligent about the use of available technology with the goal of improving the rating per unit cost and improving the availability of the power converter.

## Configurable Gate Drives

The advances in microcontroller and complex programmable logic device (CPLD) technology have made it possible to integrate advanced functionality into a product, such as a gate driver, in a cost effective manner.

One such application of this technology is to create a two-way communications protocol that runs over the same fibre as the traditional PWM and ACK signals. The two-way communications protocol, Power Insight, can be used to configure the gate driver in situ over the fibre-optic link.

Figure 1 shows a gate driver used for evaluating the performance of the next-generation IGBT modules (for example nHPD2, LV100, XHP). Designers need to evaluate the performance of the new IGBT modules under different switching conditions, different numbers of paralleled IGBT modules and different configurations of the gate drive.

Using the Power Insight protocol, and the support tools from Amantys, the power stack designer can easily test many different configurations of the gate drive and switching conditions without removing the gate drive from the target power stack.

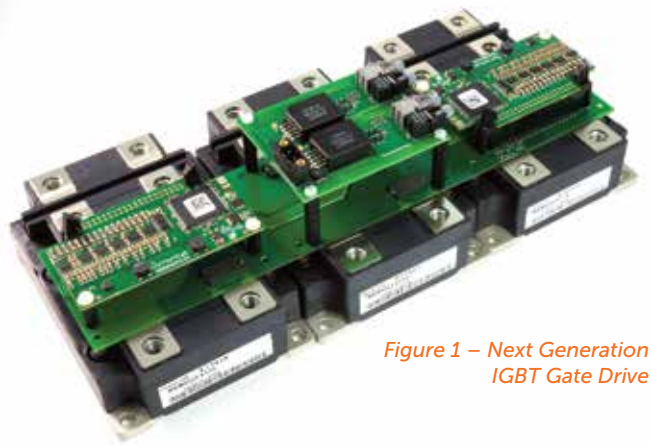

*Figure 1 – Next Generation IGBT Gate Drive*

## Switchable Gate Resistors

The rate of change of voltage, dV/dt, generated by the IGBT modules in an inverter bridge has a significant impact on any wound components connected to its output. In a motor drive, the interaction of cable impedance and motor winding capacitance causes over-voltages in the windings depending on the dV/dt generated in the inverter. Limiting the dV/dt is often a key requirement in power converter and motor drive design, which results in bulky and lossy dV/dt filters at the converter output or excessive demands on wound component insulation.

In order to mitigate this effect on converter design, the source of the excessive dV/dt – the IGBTs and diodes – should be controlled to reduce the dV/dt generated. However, this increases the switching losses significantly, reducing the converter current rating because of thermal limitations.

Using the Power Insight protocol it is possible to configure the gate according to the conditions of the converter. For example, changing the gate resistors in order to trade off the dV/dt of the IGBT and losses during the operation of the converter. Figure 2 shows the improvement in semiconductor losses when constraining the dV/dt of the converter.

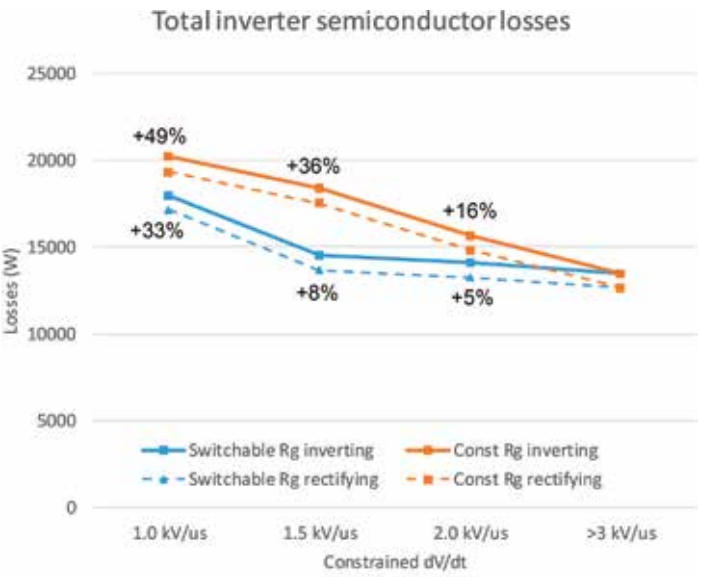


*Figure 2 – Trade-off curves of inverter stack losses vs constrained dV/dt. The ">3 kV/µs" case is unconstrained (i.e. the base case). The percentages are loss increases relative to the base case.*

## Junction Temperature Estimation

Junction temperature (Tj) estimation uses temperature-sensitive electrical parameters (TSEPs) from the IGBT and diode, measured on the gate drive, to estimate the on-chip junction temperature.

It is a novel approach that incorporates calculation of device temperature (Tj "simulation", i.e. loss look-up tables plus a thermal model), measurement of the module temperature sensor, e.g. NTC thermistor, and detailed electrical measurements of the power devices.

Junction temperature estimation enables the following features in next-generation converters:

- **Dynamic rating control: intelligent over-rate/de-rate**
- **Optimised parallel inverter stack current sharing**
- **Condition monitoring: detection of wear-out and abnormal operation, giving predictive maintenance**
- **Improved validation of inverter stack design during development and type testing**
- **IGBT/diode over-temperature detection**

All of these benefits improve the cost rating and availability of the power converter. The technology can be integrated into the gate drive and the central controller of the power converter.

## Applicability to Silicon Carbide

The use of intelligent techniques is equally applicable to silicon carbide technology, in fact they are possibly more beneficial for silicon carbide.

High dV/dt during switching creates problems that will benefit from the use of in-operation configuration. The high temperature capability of SiC will also benefit from junction temperature estimation to track the operational temperature and identify early signs of failure.

## Conclusion

Next-generation power stacks are enabled by the development of Power Insight, junction temperature estimation and control of the configuration of the gate drive according to converter conditions. Figure 3 shows the benefits of using the technology in a power stack design.

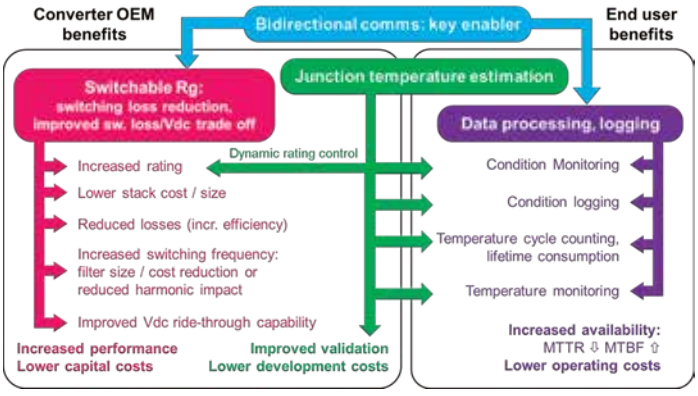


*Figure 3 – Benefits of intelligent technology in power stack design*

For the converter OEM the benefits are higher rating per unit cost and improved availability for the end user of the converter in the train. The technology enables additional services to be provided for the end user such as real-time monitoring of the converter's performance.

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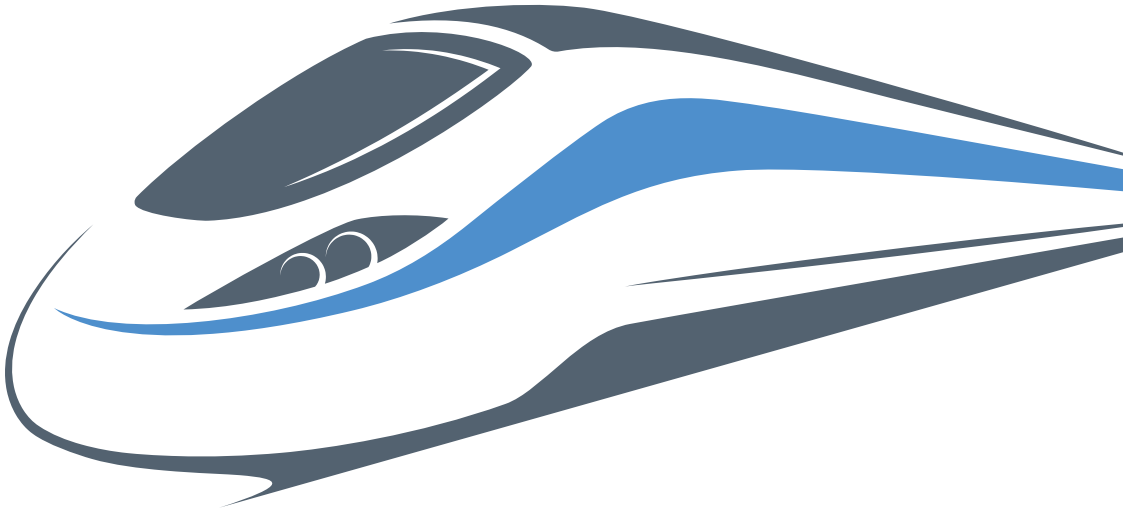

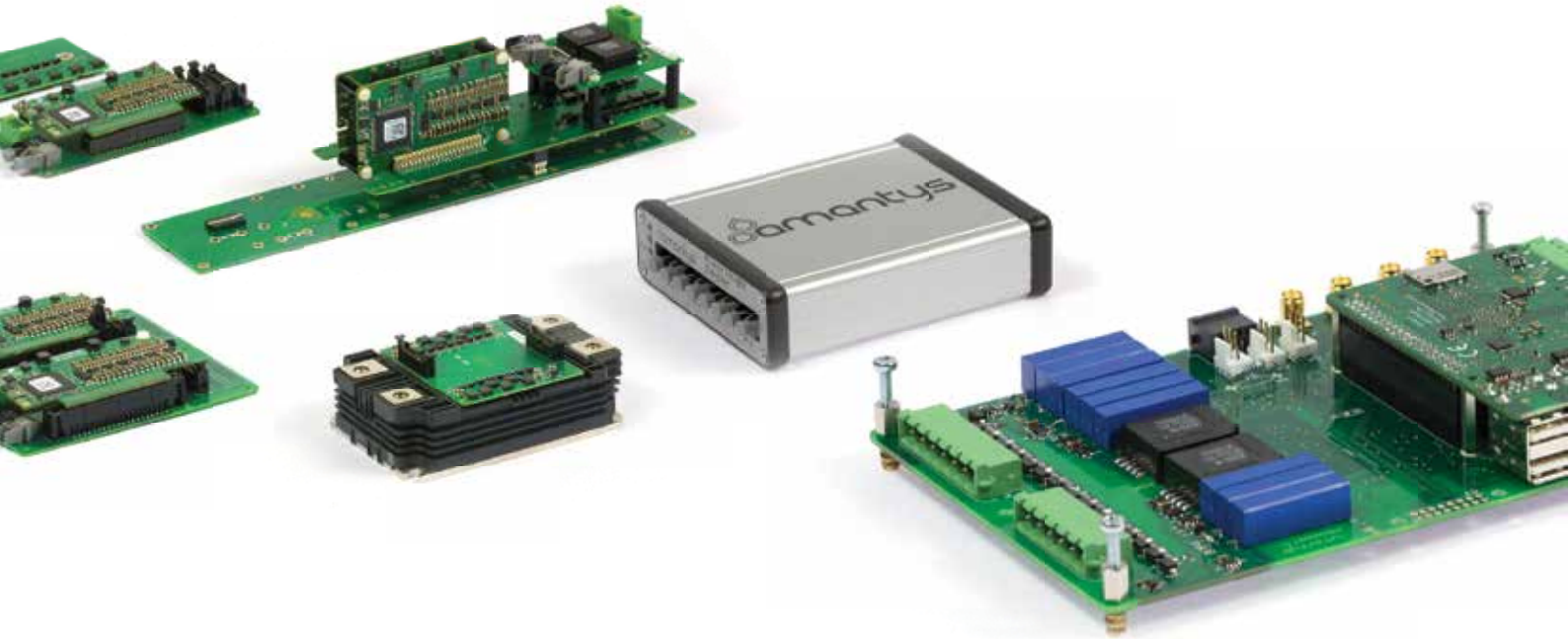


# Next Generation Power Stack Technology

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# Integrating Trackbed Inspection Data for Improved Condition-Based Maintenance Planning

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## Introduction

The routine measurement and integration of track condition data provides track engineers with tools to conduct more effective and predictive maintenance. Traditionally, regular measurement of track geometry (TG), a functional condition of the track, has provided key insights into the deterioration of track performance. The addition of ground penetrating radar (GPR) for the continuous measurement of trackbed parameters such as ballast fouling and layer thicknesses provides a quantitative structural measure of the trackbed condition that allows track engineers to detect the early signs of failure of ballast and substructure components. Maintenance recommendations can be derived from customised decision criteria including GPR survey metrics (Figure 1). This results in the more effective utilisation of high-output ballast maintenance machinery, leading to a direct savings in maintenance costs, time on track and improved asset reliability. The ability to address the root cause of track failures through improved knowledge of the trackbed condition reduces the number of repeat track geometry faults, resulting in improved track availability and thereby traffic velocities.

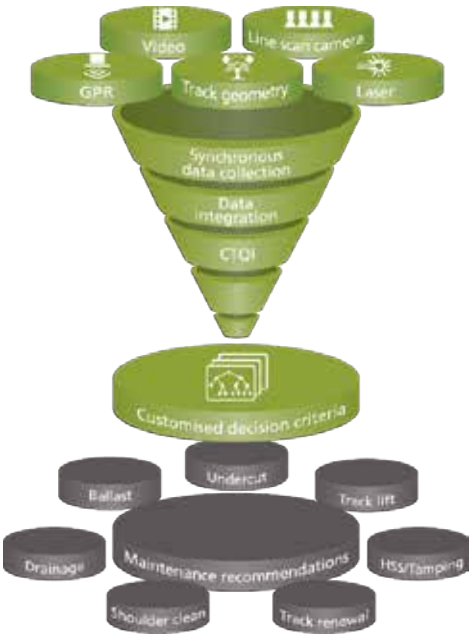


*Figure 1: Data Integration for maintenance recommendations*

## RASC® Survey

The RASC® concept involves integrated data capture of a suite of complementary track inspection technologies (including GPR), which together allow a comprehensive assessment of both the above and below-ground condition of the trackbed. Zetica Rail RASC® systems are used to undertake over 30,000km of trackbed surveys worldwide each year, utilising inspection trains and hi-rail vehicles.

GPR is a well-established non-invasive inspection method utilised by railways around the world to determine the condition of ballasted trackbed, both in terms of ballast condition and the trackbed profile. Surveys typically utilise both high and low-frequency ultra-wideband antennas to obtain sufficient resolution and depth of investigation for the analysis of both the ballast condition and for mapping formation and subgrade layer depths.

The primary aim of GPR surveys is to provide metrics for use in planning condition-based trackbed maintenance (ballast cleaning/undercutting, shoulder cleaning, surfacing/tamping) and to provide information on the anomalous condition of sub-ballast and formation layers for helping to determine the root cause of more localised trackbed problems. The metrics are designed to provide a standardised means of quantifying the information contained within the often complex GPR datasets.

### Typical GPR trackbed condition metrics include:

- **Ballast Fouling Index**
- **Fouling Depth Layer Index**
- **Layer (Interface) Roughness Index**
- **Moisture Likelihood Index**
- **Ballast Pocket Index**

## Data Integration Examples

Making better use of track inspection data is key to the continuing efforts to drive down maintenance costs. The integration of GPR and other track measurements, such as track geometry (TG), tie condition and ballast surface imagery, has the potential to significantly improve the effectiveness of condition-based trackbed maintenance.

### Identifying Areas Most Prone to a Deterioration in Trackbed Quality

GPR can help assess the nature and severity of underlying trackbed defects at the early stages of a developing geometry fault.

Repeat surveys enable the progression of the defect to be monitored in detail (often revealing the effects of seasonal influences on trackbed stability), information which can be fed into predictive track-deterioration models. Areas were the GPR-derived metrics are stable over time may be considered less likely to undergo rapid or catastrophic failure.

In the example illustrated in Figure 2 short-wavelength trackbed defects (settlement and ballast pumping) are associated with a deteriorating track geometry. None of the TG anomalies represented an actionable exception at the time of the survey.

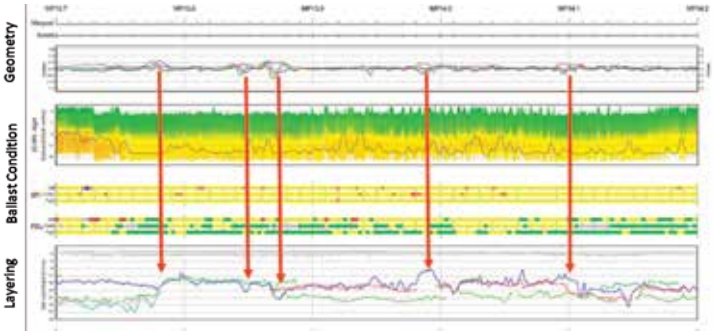


*Figure 2: Example illustrating track geometry faults developing from irregular subsurface layering*

### Determining the Extent of the Trackbed Defect Associated with a Geometry Fault

An isolated track geometry fault will often represent the surface expression of a much more extensive subsurface problem.

Unlike more traditional site inspection methods such as trial pits, windowless sampling and cone penetrometer tests, GPR provides a continuous high-resolution image of the trackbed that enables accurate delineation of the extent of the associated trackbed defect. This helps to ensure that the fault is fully rectified first time, thereby reducing the potential for costly revisits to site.

The example in Figure 3 illustrates the benefits of combining GPR with surface imaging to help reveal the full extent of subgrade failure associated with active surface mud spots.

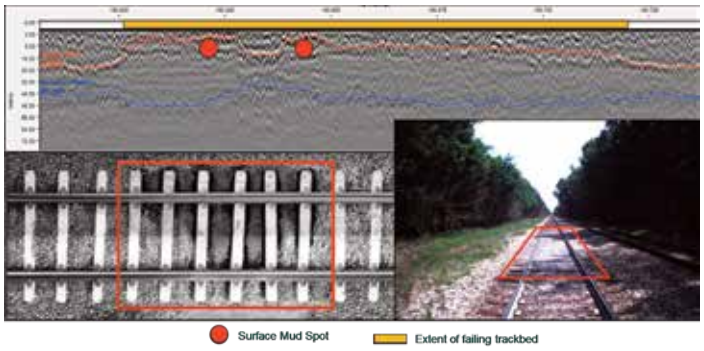


*Figure 3: Example of synchronous trackbed GPR data over an area of subgrade failure (mudspots). By utilising area scan and linescan imagery with GPR the full extent of the failure is realised.*

### Predicting Possible Sleeper/Tie Condition Deterioration

Poor trackbed condition does not only affect the functional condition of the track through track geometry deterioration, but can also lead to sleeper

deterioration and breakages. Correlating typical trackbed conditions to the sleeper condition can assist in predicting situations that lead to poor sleeper condition (Figure 4).


*Figure 4: Example of correlation of poor sleeper (tie) condition with a range of trackbed metrics including ballast condition (average fouling & fouling depth), trackbed drainage and track geometry. The blue outline shows where sleepers (ties) might be considered to be at risk of accelerated degradation.*

## Assessing the Cause of a Track Geometry Fault

As well as determining the extent of the problem, having a detailed picture of the state of the trackbed down to subgrade, can assist in determining the underlying cause of a fault (e.g. ballast pocket, subgrade failure, moisture). Figure 5 is an example of a Trackbed Inspection Report (TBIR).

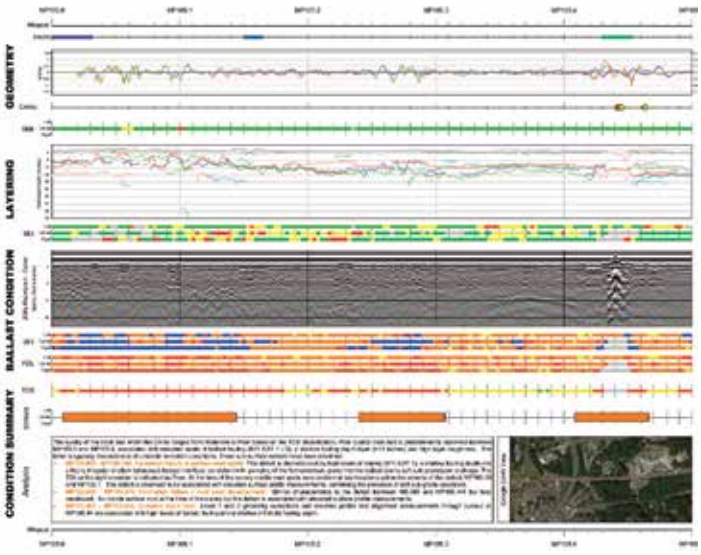


*Figure 5: Example of a trackbed inspection report (TBIR) combining track geometry (Top, Alignment, Twist) with a GPR radargram, GPR-derived Ballast Fouling Index (BFI), Fouling Depth Layer (FDL) and overall Trackbed Condition Summary (TCS). Geometry exceptions correlate with a turnout with fouled ballast. Incipient TG faults which do not (yet) exceed exception levels are associated with failed formation as indicated in the plot.*

Where GPR data is collected in conjunction with geometry on track inspection vehicles the RASC® system can be configured to generate near real-time outputs in response to specific track geometry faults, enabling track engineers to quickly diagnose the potential cause of the fault.

## Improved Ballast Cleaning Recommendations

A North American client commissioned an RASC® survey of an 80-mile section of primary route corridor in order to assess the most appropriate locations for capital maintenance ballast cleaning.

The GPR-derived Ballast Fouling Index (BFI) data were combined with a track geometry Track Quality Index (TQI), to generate a ballast cleaning Work Order Recommendation (WOR). The WOR identified locations where either the shoulder or centre BFI was higher than a specified threshold and where the TQI was poor. The high-resolution (15-ft) WOR results were clustered in order to identify minimum ¼ mile work sites, with sites constrained by road crossings, under-bridges and turnouts (switches) (Figure 6).

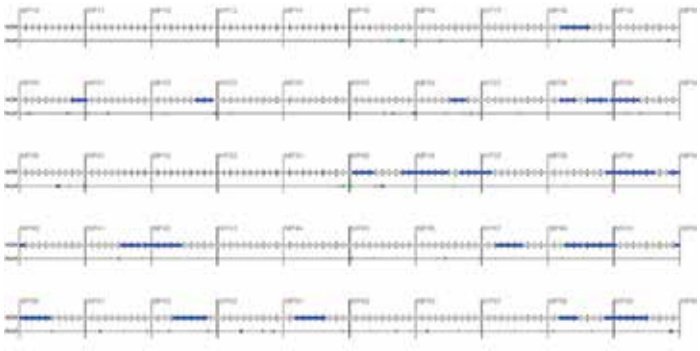

*Figure 6: The results of the Work Order Recommendation (WOR) are presented as track charts detailing where on a particular line specific maintenance activities need to be undertaken.*



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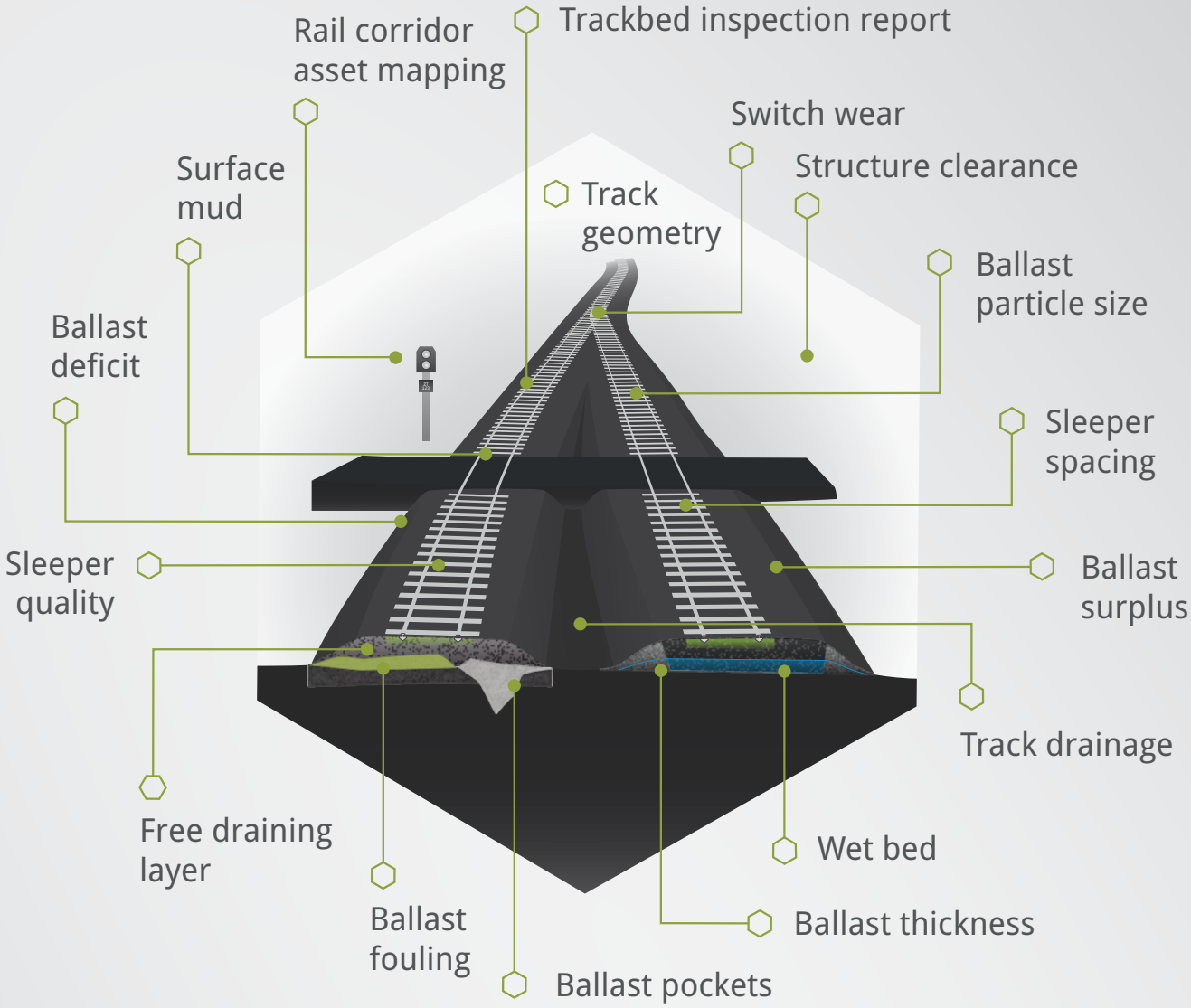
# Trackbed Information for Maintenance Planning

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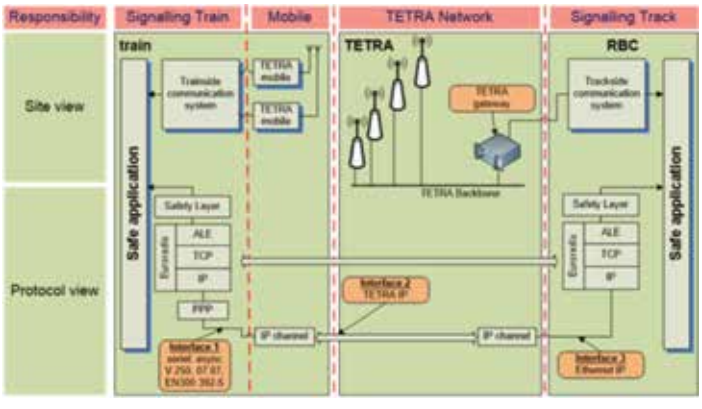
# SIEMENS and DAMM complete testing of ETCS over Tetra Packet Data to provide safe, secure and reliable communications

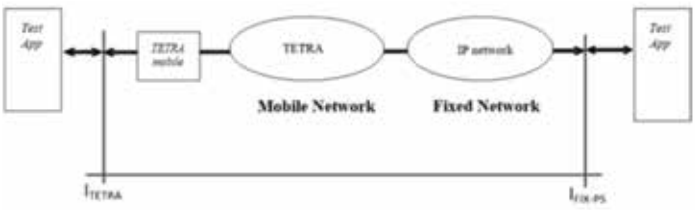
## Siemens and DAMM complete ETCS tests that document full interoperability between train-borne units and wayside radio broadcast centres

SIEMENS and DAMM have together successfully implemented and tested an open and interoperable Tetra packet data solution which complies with the demands for ETCS (European Train Control System) Level 2.




*The figure above shows the ETCS-over-TETRA architecture.*

The tests were mainly focused on bandwidth requirements and the reliability of data delivery. They were performed according to UNISIG Subset-093 (PS version) – the communication requirement specification for ETCS describing the worst-case conditions for ETCS communication. The picture shows test architecture:




Siemens decided to use packet data as this service provides scalable and sufficient bandwidth for ETCS level 2. Furthermore, unlike circuit-switch service the data are fully interoperable between vendors of

a train-borne OBU (onboard unit) and a wayside RBC (radio broadcast centre) along the rail track.

The solution tested provided two dimensions of interoperability. First the interoperability between Tetra vendors who have completed interoperability tests for packet data. Secondly, the interoperability between OBU and wayside RBC vendors secured by the use of standard ETCS L2, which is also specified for GSM-R packet data. Within the solution tested the standard was kept; the main change was the replacement of the GSM-R hardware with TETRA hardware. In this way the SIL (safety integrity level) was kept between both train-borne OBU and wayside RBC.

Results of these tests have proven that data transmission quality in both directions was always above requirements of the standard and that TETRA delivered equal or even better results than a GSM-R system.

## Sven Hagenbuck, responsible for Siemens Mobility sales in Australia, explained:

"Thanks to the easy integration based on a pure IP interface and the longer life time expectation of TETRA systems, this solution can be beneficial or be an alternative, wherever GSM-R is not mandatory due to authority regulations".

DAMM and SIEMENS are proud of the achieved results. In order to receive more information about the benefits of ETCS over TETRA packet data please contact SIEMENS or DAMM.

## About DAMM Cellular Systems

DAMM is a world-leading provider of scalable, flexible and user-friendly digital radio infrastructure systems to industrial, commercial and public safety customers. Built for the future of critical communications, the DAMM MultiTech Platform enables voice and data communication across technologies, including TETRA, TEDS, DMR and Analog in one single system. With over 35 years of experience in critical radio and broadband communication, we take the lead through superior engineering and a constant focus on customer needs and reduced complexity. To find out more about DAMM or any aspect of our solutions or services, visit **www.damm.dk** or follow us on LinkedIn.

## About Siemens Mobility

Siemens Mobility is a separately managed company of Siemens AG. As a leader in transport solutions for more than 160 years, Siemens Mobility is constantly innovating its portfolio in its core areas of rolling stock, rail automation and electrification, turnkey systems, intelligent traffic systems as well as related services. With digitalization, Siemens Mobility is enabling mobility operators worldwide to make infrastructure intelligent, increase value sustainably over the entire lifecycle, enhance passenger experience and guarantee availability. In fiscal year 2017, which ended on September 30, 2017, the former Siemens Mobility Division posted revenue of €8.1billion and had around 28,400 employees worldwide. Further information is available at: **www.siemens.com/mobility**

## For further information about DAMM, please contact:

**Torben Østerby**,
Key Account Manager
E-mail: **toe@damm.dk**

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# Upcoming Railway Events & Exhibitions

## September, October, November 2018

### Fire Protection and Safety in Tunnels 2018

**12–13 September 2018**

The 2018 edition of Fire Protection and Safety in Tunnels (FPST) will showcase major innovations for designing, implementing and upgrading tunnel fire and safety projects. Marking the 10th year of running the prestigious event, it will be attended by global key speakers from organisations such as Transport for London, ASFINAG, Rotterdamsebaan, Metroselskabet and Roxel.
**Location:** Oslo, Norway

### AREMA 2018

**16–19 September 2018**

AREMA 2018 – This Annual Conference & Exposition is the premier event for railway engineering professionals. Track, structures, passenger & transit, maintenance, engineering services and communications & signals – this conference has something for everyone!
**Location:** Hilton Chicago, South Michigan Avenue, Chicago, IL, United States

### The 2nd ASEAN Rail Summit 2018

**27–28 September 2018**

This summit is fully supported by ten rail institutes from eight countries of the Association of Southeast Asian Nations (ASEAN), including the Ministry of Transport of Malaysia, the Ministry of Human Resources of Malaysia, the Embassy of the People's Republic of China in Malaysia, the State Railway of Thailand, the Philippine National Railways, the Light Rail Manila Corporation, SMRT, the Light Rail Transit Authority, Sri Lanka Railways, the Ministry of Transport and Civil Aviation Sri Lanka.
**Location:** Kuala Lumpur, Malaysia

### Policy Forum for London

**11 October 2018**

Delivering the Elizabeth Line and the outlook for Crossrail 2: expanding capacity, opportunities for London, and looking beyond the Affordability Review – This seminar will provide a timely opportunity to assess the challenges for delivering the Elizabeth Line in December 2018, and Crossrail's completion in 2019, and will bring out latest thinking on the proposed Crossrail 2 project.
**Location:** Central London

### Rail~Volution 2018

**21–24 October 2018**

For over 20 years, Rail~Volution has been the place to engage in thoughtful discussions with change makers and influencers, the place to share ideas and breakthroughs, frustrations and inspiration, about building liveable communities with transit. The event provides learning opportunities to equip industry members with best practices. It connects and expands industry member networks with leaders in the public transportation, transit-oriented development, place-making and community development fields.
**Location:** Pittsburgh, PA, United States

### 3rd Annual Saudi Freight & Logistics 2018

**22–23 October 2018**

The global logistics market is estimated to be worth $15.5 trillion by 2024 and Saudi Arabia is leaving no stones unturned to capture a good chunk of the same and establish itself as the trade and logistics hub of the Middle East region, connecting Asia, Europe and Africa.
The 3rd Annual Saudi Freight & Logistics 2018 programme will address the current opportunities and challenges in the freight and logistics sector in the Kingdom. The organisers look forward to welcoming the interested participants to share the platform and be a part of the event.
**Location:** Olaya St, Al Olaya, Riyadh 12241, Saudi Arabia

## SmartTransit

### 23–25 October 2018

SmartTransit will offer three days of case studies, interactive workshops and roundtables as well as networking. The event is an exclusive opportunity to meet peers and apply their knowledge. SmartTransit's partnership with SEPTA puts the organisers in an excellent position to be able to provide great insight into the transit industry.

**Location:** Pennsylvania Convention Centre, 1101 Arch St, Philadelphia, PA 19107, USA

## HSR Asia 2018

### 24–26 October 2018

Attend HSR Asia 2018 in India this October for the latest updates on high-speed rail developments and projects across the Asia Pacific region with a timely focus on India's fast developing high-speed rail programme. Network with key policy makers, government, business leaders and industry experts to develop partnerships, identify opportunities and assess challenges in the high speed rail sector to gain competitive advantage.

**Location:** New Delhi, India

## The Philippine Railway Modernization and Expansion Summit

### 24–25 October 2018

The Philippine Railway Technology and Investment Forum will feature the most prominent industry leaders and government officials from across the region providing informative and inspiring discussions pertaining to region's current needs and their ambitious future. The Philippines welcome the international community to join this forum to discover new strategies and technologies that can assist in building a state-of-the-art railway infrastructure and modernisation.

**Location:** Solaire Resort & Casino, Aseana Avenue, Parañaque, Metro Manila, Philippines

## SmartMetro

### 29–31 October 2018

The SmartMetro congress provides a meeting place for senior metro, tram, and light-rail technology experts from all global regions. As cities face major urbanisation and congestion challenges, digitalisation, automation, and shared mobility are rapidly changing the urban mobility landscape.

**Location:** Le Méridien Etoile, 81 Boulevard Gouvion Saint-Cyr, 75848 Cedex 17, 75017 Paris, France

## Transport Security Europe

### 29 October 2018

After the successful launch event in the United States, the organisers invite you to their European edition of the Transport Security Congress where you can join security and safety leaders working across all transportation sectors to: benchmark yourself against other transportation verticals, defend against growing cyber threats, protect people, assets and revenue, learn about technologies from enhanced monitoring, surveillance, and scanning to data analytics and machine learning, and comply with the NIS Directive recently enshrined in EU law.

Transport Security Europe is also co-located with the 9th annual SmartMetro Congress.

**Location:** Le Méridien Etoile, 81 Boulevard Gouvion Saint-Cyr, 75848 Cedex 17, 75017 Paris, France

## Rail+Metro/Tunnel China 2018

### 07–09 November 2018

Since its debut in 2002, Rail+Metro China has established itself as one of the largest and most respected business-to-business platforms for trade, procurement and promotion in the inter-city and metropolitan rail transit industries in China and the Asia Pacific region. Rail+Metro China is dedicated to conveying the most practical industry information and to building on its leading reputation as a fully integrated B2B platform.

**Location:** Shanghai New International Expo Center, Century Park, Pudong, China, 201203

## AusRAIL 2018

### 27–28 November 2018

Australasia's premier rail industry event is set to take place on 27–28 November 2018 at the National Convention Centre, Canberra. AusRAIL 2018, hosted by the Australasian Railway Association (ARA), will attract over 700 senior attendees to the conference programme which includes plenary sessions, technical streams and forums with well-respected industry leaders and CEOs. The conference theme for this year is 'Rail – For a better future'. It will delve into the economic, social and environmental benefits and future opportunities of rail in developing a better integrated, liveable and prosperous society.

To register and for full event information, please visit the AusRAIL 2018 website.

**Location:** National Convention Centre, Canberra, 31 Constitution Avenue, Canberra ACT 2601

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# Automatic measuring stations for wheelset dimensions measurement

## This year Amest has developed a new solution for the automatic control of wheel-set dimensions by using patented 4 dynamic measuring heads placed on cross-linear supports.

The measuring station for wheelsets control can be placed on automatic production lines or operated in manual mode.

## Measured parameters

- **Wheel diameters**
- **Radial and axial run-out of the wheels**
- **Track gauge value**
- **Dimension A, B**
- **Brake disc positions, thickness and their axial run-out**
- **Measurement of wheelsets with gear box**

## Description of device measuring cycle:

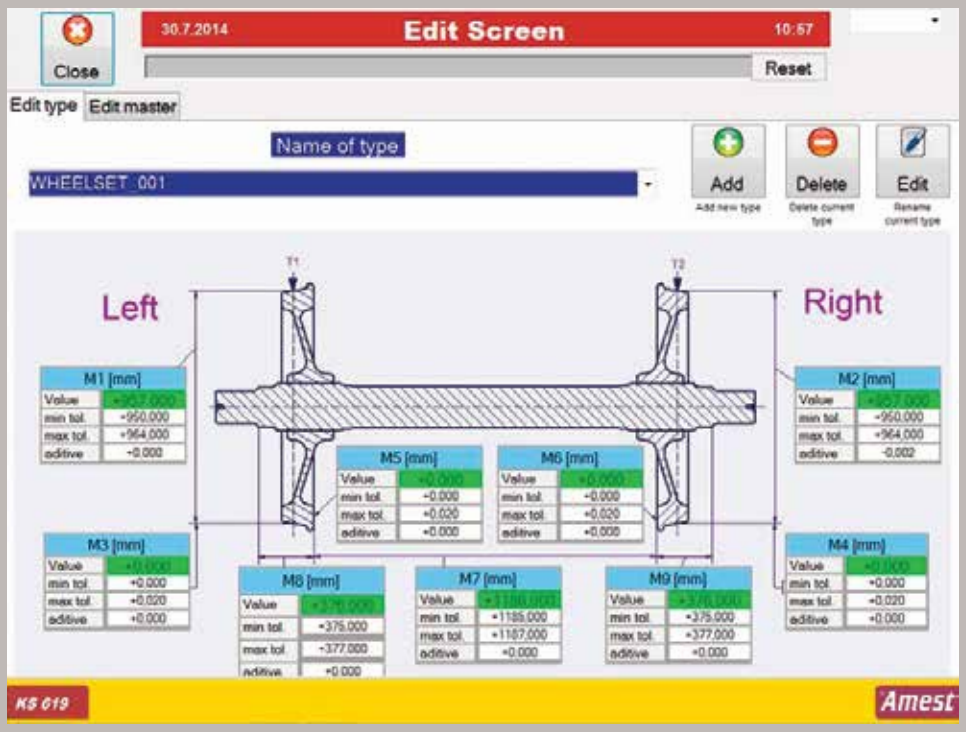
Clamping tailstocks will clamp wheelsets into pins and always lift wheelsets to the same height, regardless of wheelset type. The wheelset will rotate while it is being lifted. Dynamic measuring heads on cross-linear supports measure all parameters during wheelset rotation.

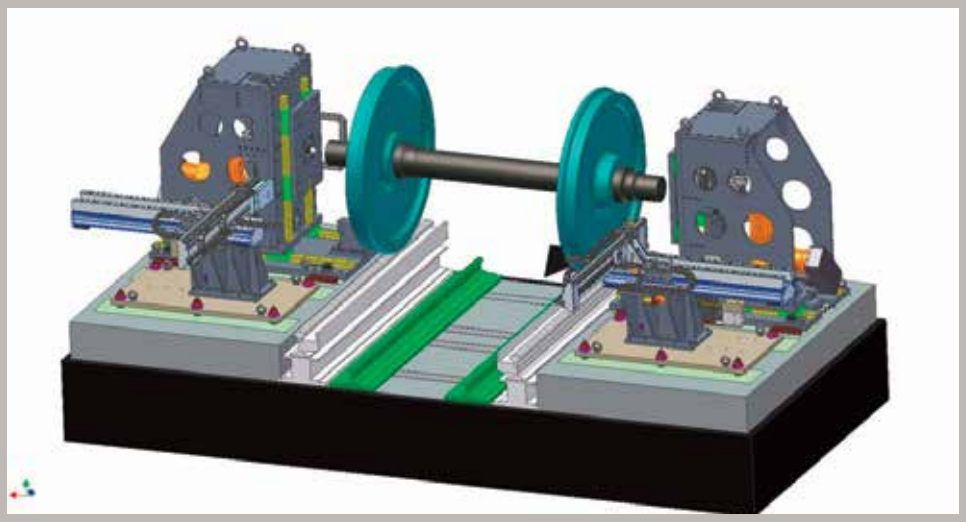
After the measurement the dynamic measuring heads move back to their basic positions and clamping tailstocks put the measured wheelsets into rails, where an external manipulator takes them for subsequent sorting into good pieces and scrap.

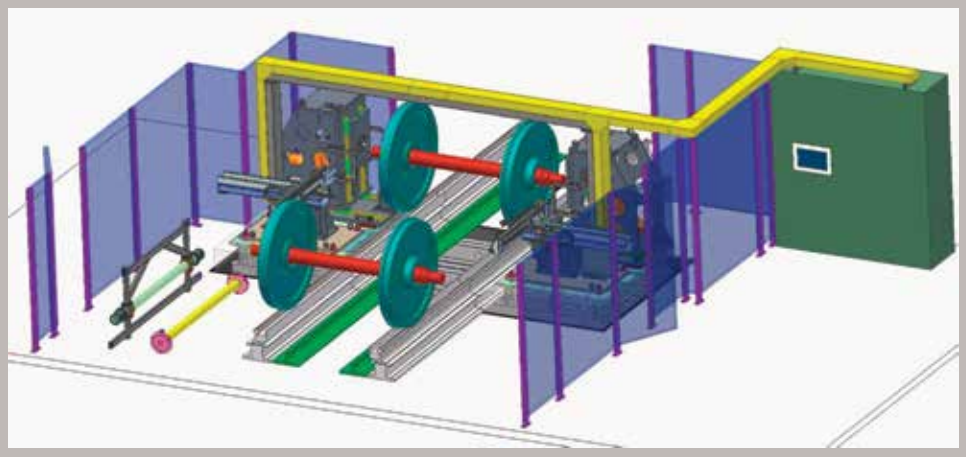
Proof of this successful solution is an order for 3 units of this device for a Chinese customer.

**AMEST s.r.o.** has successfully supplied measuring stations for railway equipment manufacturers in Russia (URALVAGONZAVOD); Septemvri, Bulgaria (KOLOWAG); Lovere, Italy (LUCCHINI); Taiyuan, China (TYHI); Bohumín, Czech Republic (BONATRANS); RaeBareli, India, (Modern Coach Factory); Ekibastuz, Kazakhstan (R.W.S. Wheelset)

These manufacturers have been operating the AMEST stations on multiple shift operations; their performance, range, and functions have raised the interest of both other foreign railway industry companies and the expert public. AMEST experts have used the experience gained in operation with these customers to further improve the technology.





**Amest s.r.o.**
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**Tel.: +420 246 051 111**
**Fax: +420 272 705 754**
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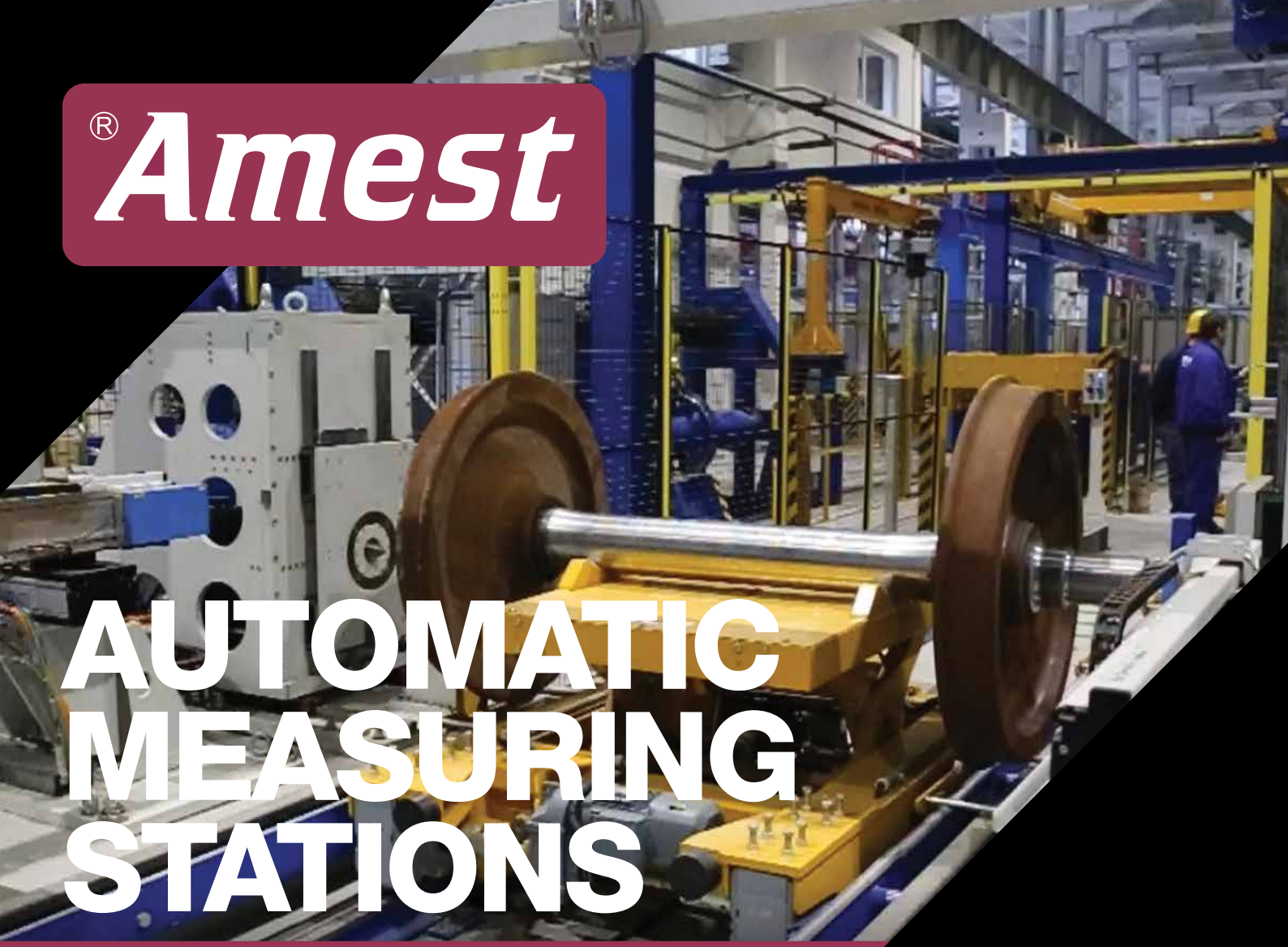


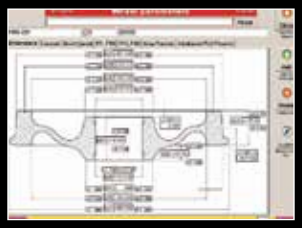
# AUTOMATIC MEASURING STATIONS

## HIGH ACCURACY
## FLEXIBILITY
## FAST MEASUREMENT

We specialises in the development, construction, installation and service of automatic measuring stations for production control of railway components.

We measure:

- **Axles**
- **Wheels**
- **Wheelsets**
- **Others**




**www.amest.cz**

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# Parker Hannifin to Present Motion and Control Solutions for Rail at InnoTrans 2018

## Parker Hannifin will again be exhibiting at this year's Innotrans rail exhibition in Berlin.

Visitors to Parker at Stand 206 in Hall 10.2 in the Railway Technology section will have the opportunity to see a wide range of components and solutions from multiple technologies on offer to the rail industry and to discuss their applications with the company's experts.

Employing around 58,000 individuals in 49 countries and boasting expertise in nine different areas – hydraulics, pneumatics, electromechanical, filtration, fluid & gas handling, climate control, process control, sealing & shielding, and aerospace – Parker is able to satisfy a wide variety of customer requirements, effectively acting as a 'one stop shop' to serve the needs of the latest motion and control systems and applications in the rail sector and help drive advancements in the industry.

### Key Product: Parker's Pantograph Unit

One of Parker's key solutions featured at its stand at InnoTrans this year is its pantograph unit. Over the last 40 years the rail industry has seen significant changes in structure, operation and technology. One of the biggest changes has been the move away from dependence on diesel as the main motive fuel and the increasing electrification of railway networks, leading to train manufacturers looking for innovative solutions in the area of 'current collection'.

Today, the pantograph, a familiar sight on top of rail vehicles, is designed to allow travel at high speeds without losing contact with the overhead catenary lines. The pantograph arm pushes a contact shoe up against the underside of the power cable drawing the electricity required to power the train. Typically, compressed air is used to control the basic raise, hold, lower and fast-drop functions of the arm. However, demand for additional vehicle or end user-specific functions, such as contact strip wear monitoring, is increasing, meaning it is essential for any OEM designing and manufacturing pantographs to partner with a company that delivers in-depth experience and knowledge, especially of pneumatics.

So what has our experience shown us? It's been highlighted to us that the following needs are critical to the rail market:

- **Overall reduction in vehicle weight**
- **Increase in available passenger space**
- **Initial acquisition and whole-life cost reductions**

Development of new 'current collection' solutions can make a significant contribution to meeting these identified needs.

But where do we begin? Well, the majority of pantograph systems require the availability of a compressed air supply for the first lift after a vehicle outage period. Why? Because the vehicle's main compressors are usually not powered up until the pantograph has an established electrical connection to provide system power. This is normally solved by the use of an auxiliary compressor to deliver this supply. However, this approach has its drawbacks; the main ones being cost of procurement, the amount of physical space required to install the compressor, installation times and the on-going whole-life costs associated with servicing and maintenance.

How is this problem solved? Simple: eliminate the need for the auxiliary compressor by designing a compact, fully-integrated 'plug and play' control system, containing all the pneumatic functions and incorporating a reservoir.

The newly redesigned main control module system is linked to a reservoir, charged during normal operation via a 2/2 solenoid valve contained within the module. The pantograph system draws compressed air for its initial operation from this reservoir. The integrated 2/2 valve is vital for overall system performance. In its de-energised state it retains the reservoir's air charge for up to 5 days, ensuring reliable pantograph operation after moderate outage periods. Cleverly, the provision of a separate external air supply connection allows the system to operate even after extended outages.

As a result, this innovative approach addresses some of the key market needs whilst enhancing whole system performance.

**Reduced vehicle weight** - there is now a single plug and play module, designed to achieve all required functionality with a minimum space envelope and weight. The weight of the auxiliary compressor and its associated installation components such as mounts, connectors and tubing are removed.

**Increase in available passenger space** – the module is now small enough to fit in a reduced space envelope making its installation location more flexible to suit carriage layout. The space required for the ancillary compressor has been eliminated, increasing available space in the carriage.

**Initial acquisition and whole-life cost reductions** – the initial acquisition costs are now lower and the vehicle initial installation costs are reduced due to elimination of the auxiliary compressor. A side benefit is process simplification, demonstrated by a reduction in the number of component suppliers, orders raised and managed, as well as assembly and testing work because the control unit is supplied fully function tested, ready to just 'plug and play'. All of these factors have a positive impact on the total lifetime cost.

The benefits of a single module approach don't stop at installation and procurement. It's essential in today's modern rail environment that service and maintenance times are kept to a minimum, optimising vehicle operational time and profit. Having only one module that can simply be replaced as a whole unit (rather than individual parts) is tremendously beneficial in terms of servicing and maintenance. Due to its plug and play qualities the system can quickly be decommissioned, serviced, repaired and re-commissioned with ease, resulting in less downtime.

## Parker at InnoTrans 2018

Come and visit **Parker** at **InnoTrans** at **Stand 206, Hall 10.2** from 18–21 September to see our pantograph unit and our comprehensive range of solutions for the rail industry and discuss your application needs with the company's motion and control experts.

For further information or assistance prior to InnoTrans, please contact Parker at **rail@parker.com** or visit **parker.com/rail**


# WINDHOFF MPV®

## FOR CONSTRUCTION AND MAINTENANCE OF OVERHEAD LINE SYSTEMS & TRACK

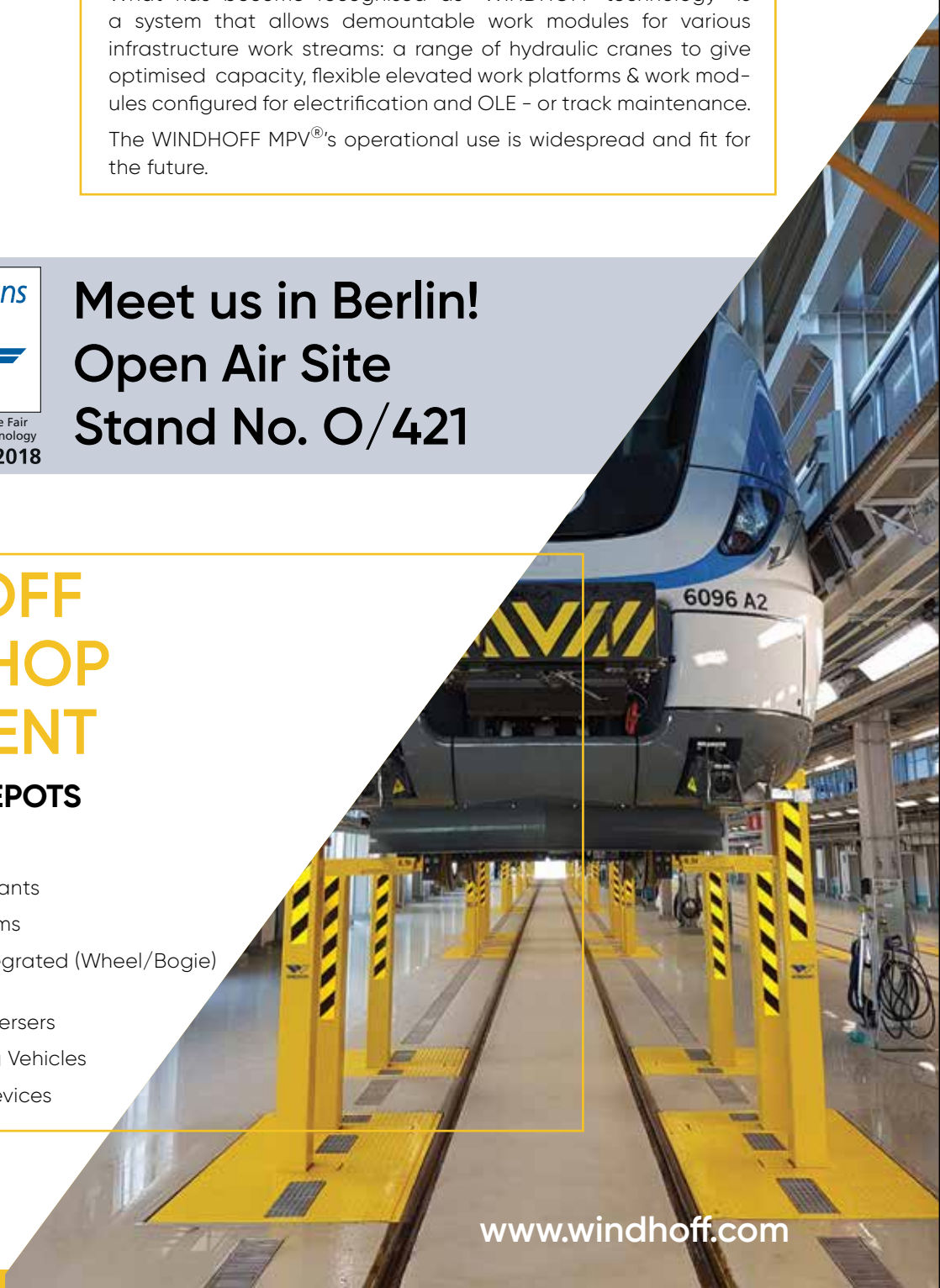
WINDHOFF Modular Concept: Maximum versatility with the MPV® due to the modular vehicle design.

What has become recognised as "WINDHOFF technology" is a system that allows demountable work modules for various infrastructure work streams: a range of hydraulic cranes to give optimised capacity, flexible elevated work platforms & work modules configured for electrification and OLE - or track maintenance.

The WINDHOFF MPV®'s operational use is widespread and fit for the future.

InnoTrans
International Trade Fair for Transport Technology
18–21.09.2018

## Meet us in Berlin!
## Open Air Site
## Stand No. O/421




# WINDHOFF WORKSHOP EQUIPMENT

## FOR RAILWAY DEPOTS

- Lifting Jacks
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- Turntables and Traversers
- Rail-Road-Shunting Vehicles
- Bogie Measuring Devices

WINDHOFF

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# Rail-Road Shunting Vehicles

## WINDHOFF rail-road shunting vehicles are emission-free and low-noise power packs.

They comply in full with current sustainability and energy-efficiency requirements. These vehicles are characterised by low operating and maintenance costs combined with a very high degree of automation.

The flexibility with which rail-road shunting vehicles (ZRW) can be used makes them ideal for shunting in ports, private transshipment and company sites or in small railway networks. The emission-free vehicles can be used flexibly and are able to mount and/or dismount from the rails at any location with a closed track. Due to the vehicles' full rubber tyres and related friction value μ, traction can be increased to the maximum – even on wet rails. In comparison with conventional diesel locomotives, maintenance costs can be reduced by up to a factor of 10, not least because electric vehicles are usually only serviced once a year.

WINDHOFF offers a consistent model range from the ZRW15AEM (weight 7t) to the ZRW125AEM (weight 29t). Depending on the vehicle model, trailed loads of 200 to 4,000t can be moved. The charging technology and battery size are always adapted to the individual requirements. Batteries weighing up to 3.5t with outputs of up to 124,000 Wh are used. The ZRWs' design is based on robust rail vehicles. Railway-specific requirements on fatigue strength, frame stability (e.g. buffer impact), coupling systems, track guidance, compressor systems, radio systems and derailment protection were taken into consideration during development.

The equipment can be compiled individually thanks to the vehicles' modular design. Depending on the vehicle model and operating location, various equipment features are available: lighting as per UIC or local regulations, compressed air supply, buffing and draw gear as well as buffers according to customer requirements, radio remote control, bumper buffer systems,



sanding equipment and double heading. To enable fast and efficient performance of international service, the vehicles can be equipped with remote maintenance. This allows the PLC control system to be accessed at any time via wi-fi or GSM.

Berliner Hafen- und Lagerhausgesellschaft mbH (BEHALA) operates the Westhafen in Central Berlin and the Südhafen in Berlin-Spandau. For shunting within the port, an electric WINDHOFF ZRW50AEM rail and road vehicle is used to move wagon groups with a train weight of up to 800 tonnes.

The WINDHOFF ZRW125AEM with battery drive shunts without sound or smoke at EMW Stahl Service GmbH, a modern, responsible and environmentally aware company located in Neunkirchen. The wagons carrying steel coils are positioned via radio remote control in diverse shops, where they are unloaded using shop cranes. This load is hauled with up to 140kW through a track curve with gradient.

WINDHOFF has developed a special-purpose RW60AEM-QF vehicle using rail-road technology for the ICE depot in Cologne-Nippes. A hydraulic transverse gear enables this vehicle to be driven sideways out of the track area on to concrete slabs.

WINDHOFF Bahn- und Anlagentechnik GmbH, Rheine, Germany, is a globally operating manufacturer with a broad portfolio of technologically sophisticated products in the railway vehicles, rail and shunting technology sectors.

# Connectors for the Rail Industry

## Know-how-transfer from automation industry to rail

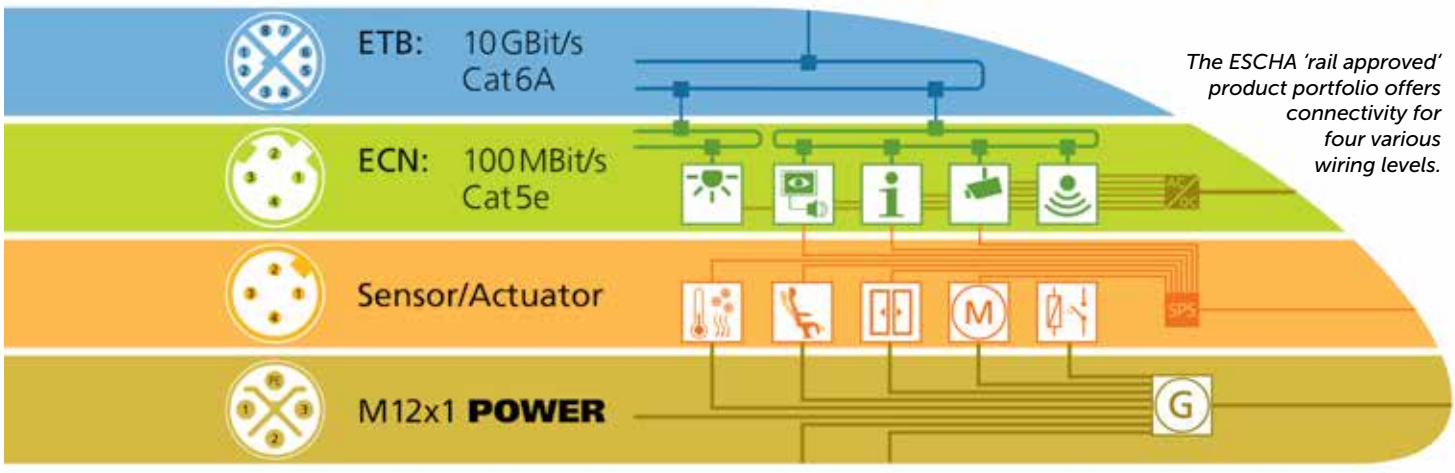
Round connectors with high IP-protection classes are standard for industrial applications. The connectivity specialist ESCHA has transferred the indisputable benefits of this technology to the rail industry and will display new connectors meeting the high requirements of 'rail & transportation' application areas at InnoTrans 2018.

As far as water and dust tightness as well as diversity and variance are concerned, the industrial round connector is simply unbeatable. It provides high safety and reliability through its plastic overmold. Moreover, pre-manufactured connectors can be installed much faster than manual wiring via terminals leading to a high cost saving at the customer end.

Connectivity specialist ESCHA raised the question a few years ago as to how these benefits could be transferred to the rail industry. The German company very much confronted the specific requirements of this industrial sector resulting from the high safety demands and harsh environmental impacts. By using special materials, running complex product tests and additional services, ESCHA was able to launch a product portfolio for rail applications and get it established on the market. All products meeting these requirements are designated as 'rail approved' at ESCHA.

### Rail-specific Challenges and Standards

In March 2013 a uniform EU-wide standard for the fire properties of materials used in rail vehicles came into effect. Until 2016 this standard existed alongside national standards, whereupon the European EN 45545-2 became




*The ESCHA 'rail approved' product portfolio offers connectivity for four various wiring levels.*

*Connection- and junction cables with S-coding out of the 'M12x1 POWER' product range have been adapted to the rail industry requirements.*

mandatory. The relevant EN 45545-2 specifies standards including flue gas density, combustibility and inflammability as well as materials' drip-off behaviour. ESCHA accommodates this fire standard through special materials for overmold and contact carriers as well as for diverse high-grade cable qualities and provides customers with the necessary related documentations and certificates.

For reliable operation the connectors have to withstand the harsh environmental conditions they are exposed to inside or outside a train, including strong vibrations and mechanical as well as thermal stresses. ESCHA guarantees the safe and reliable operation of its products based on its own shock and vibration tests. Additionally, all ESCHA rail connectors are designed for a temperature range of -40°C to +90°C. They are dust and water tight according to protection class IP67, meeting the relevant rail industry standard EN 50155.

In addition to the safety and environmental challenges, there are special ESCHA services responding to the individual demands within the rail industry. As almost each wagon is different, ESCHA does not specify any standard cable length for its 'rail approved' products and supplies inch-perfect instead. Moreover, connectors can be equipped with custom-made pooled harnesses and markings upon request, facilitating installation for fitters.

*M8x1-connectors with 'rail approved' seal for the sensor-/actuator wiring at the third level.*

## Various Application Areas on Trains

Connectors are used in various areas on trains performing various tasks. These areas can be roughly subdivided into four wiring levels.

**1. First of all, there is the Ethernet-Train-Backbones level according to IEC 61375-3-4 where connectors facilitating extremely high data transmission rates of up to 10GBit/s Cat6A are used.**

**2. At the second level, components with data transmission rates of up to 100Mbit/s are required for the Ethernet-Consist-Network according to IEC 61375-2-5. Relevant traditional applications are e.g. video monitoring systems, passenger information and train control systems. Likewise, additional equipment like Video-on-Demand, In-Seat-Entertainment, and internet access can be realized as well.**

**3. The third level is about the conventional sensor/actuator-wiring of e.g. door systems or sanitary areas.**

**4. As to the fourth level, power connectors are used for providing a power supply within the train. ESCHA already offers the right connectors for each of these wiring levels and is showing these at InnoTrans 2018 in Berlin.**

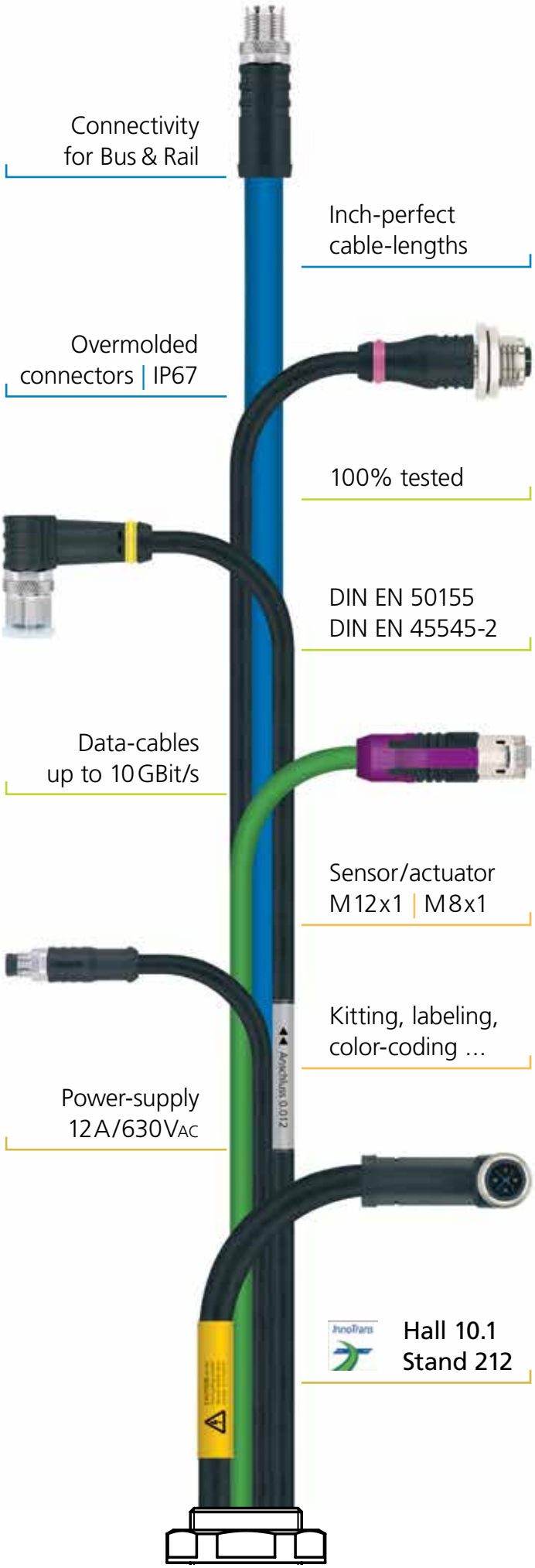
## Novelties at InnoTrans

At InnoTrans, ESCHA is showing novelties for the third and fourth wiring levels. The company previously only had on offer M12x1-connectors in the area of sensor/actuator-wiring at level three. Now, compact M8x1-components are being added. As for the power-supply level, connection and junction cables with S-coding out of the existing product portfolio called 'M12x1 POWER' have been selected. These have been adapted to the aforementioned rail industry requirements and are particularly suitable for alternating current applications up to 12A and 630V.

## Looking Ahead

ESCHA has been providing its 'rail approved' products for four years and has instigated a change in philosophy in the rail industry, abandoning manually manufacturable connectivity for overmolded connectors. The rail industry, meanwhile, has also recognised the benefits of pre-manufactured connectors. This type of wiring is basically more user-friendly and faster, and therefore more cost-effective.

ESCHA expects an upward trend towards overmolded, tested and immediately usable connectors in the rail industry. For this reason, the company is looking at more applications and talking to its customers. Eventually, ESCHA will provide new products that can be used within or outside the described four wiring levels.




ESCHA

3M Science. Applied to Life.™

# Safety. Productivity. Results.

Achieve global consistency and reliable results with scientifically-backed technology from 3M. The future of rail transport is more secure when you have the right partner.

**Visit us at InnoTrans 2018**
**September 18th–21st**
**Booth 227, Hall 8.2**

InnoTrans

# Railway Trends and Technology

Trends and technology in the rail industry can emerge and change quickly, placing significant pressure on manufacturers to stay abreast of what can feel like a moving target. Ensuring consistency across their global brands, using process-friendly products and increasing efficiencies at multiple touchpoints is no small feat, but it's attainable with the right partner.

**3M's network of global resources and expertise has helped rail operators and designers solve the big challenges in production, safety and performance for decades. With solutions rooted in science that work both better and faster, you can create a safer and more enjoyable experience for passengers.**

*3M™ Exterior Wrap Film being installed.*

## Superior Productivity

Sometimes increasing productivity is about changing the small things, and sometimes it involves rethinking your approach all together. *What if you used tape instead of rivets? What if you used a vinyl film instead of paint?* For rail designers and manufacturers, there are several ways to increase productivity and optimize efficiencies from start to finish while making your final product even more appealing.

In the assembly process, replacing mechanical fasteners, like rivets or bolts with a tape or an adhesive, has multiple benefits.

First, it cuts out steps, eliminating the need to punch holes or drill screws in preparation for application. These products can also be used to bond dissimilar materials like metals and composites, while securely holding together multiple areas of the coach including walls, panels, floors and seats. Utilizing industrial adhesives empowers manufacturers interested in light-weighting, as using tapes to assemble parts results in lighter components overall.

Metalworking and grinding is another step of the manufacturing process where there is opportunity for increased productivity and efficiency.

A simple way to revitalize output is to use abrasives that cut faster and last longer. 3M developed the concept of putting into its abrasives Precision-Shaped Grain—sharp, angular structures that continuously fracture to form sharp points. These clean, sharp points mean an abrasive that slices faster, runs cooler, and lasts much longer than conventional abrasives, which generate excessive heat buildup and have a shorter life.

Completing the finishing touches on rail, and establishing a cohesive look and feel, can take up a lot of time. Graphic films are quick to install and maintain and provide OEMs with alternatives to paint while offering the ability to achieve superior visual elements for rail design.

When the films are covered with a protective 3M over laminate, they last longer and are easy to clean.

## Safer Solutions

Keeping passengers, operators and pedestrians safe is of paramount importance for rail. 3M has solutions that not only enhance security, but also provide peace of mind that the possibility of accidents and mishaps are minimized. For windows, floors and more, there's a product you can use to further promote safety.

Safety and security window films are an effective method for mitigating glass break.

The films help keep broken glass in place to reduce risk of injury from shards or jagged edges until the window can be replaced. Utilizing floor products with anti-slip

ratings are ideal for the tops of rail cars to help maintenance workers keep their footing, as well as on the inside of coaches for riders. In the event of a fire, 3M's flame-retardant tape and films can slow the spread of flames and gives emergency personnel more time to respond. Ultimately, that is always the goal: ensuring a comfortable experience for passengers and transporting them safely to their destination.

*3M™ Safety & Security Window Film*

*3M™ 595 Window Bonder Adhesive Sealant*

## Better Results

By implementing solutions that reduce weight, improve the rider experience, and protect the interior and exterior surfaces from damage, it's possible to achieve a better end result that is vastly enhanced, aesthetic and reliable.

For manufacturers, utilizing lightweight materials has many benefits, such as improvements to the overall manufacturing process, lower maintenance costs, and a positive impact on the environment.

Adhesives and tapes are fundamentally lighter than traditional mechanical fasteners, while also providing a smoother and more aesthetic look. They can also reduce the likelihood of corrosion and deterioration occurring within the materials, which increases the entire life span of the railcar and keeps your assets looking top-notch.

For passengers, aesthetic solutions can help deliver a more comfortable experience.

From the noises and vibrations that riders hear and feel, to the interior design of the railcar, the sights and sounds that riders are exposed to are crucial to their overall enjoyment of their trip. By controlling and reducing noise, vibration and harshness with products such as vibration damping tapes and acoustic absorption insulation, a smoother and quieter trip is possible.

The interior design of the train is another crucial aspect of the rider's experience. Wrap films and interior finishes with rich textures can be used to create colorful and unique designs, ensuring that the final result is a pleasing and enjoyable environment for all rail passengers.

Rail cars travel across the world through many unique terrains, which means they require products that can withstand a variety of climates and circumstances. 3M specifically designs products and offers the 3M™ MCS™ Warranty to provide peace of mind our solutions last the life of the vehicle wherever it may be traveling, with environmental resistance ranging from Japanese mountains to Latin American deserts. Anti-graffiti overlaminates keep railcar exteriors looking clean and fresh, as they can be easily wiped down and maintained, and protect the underlying graphics.

## Conclusion

From increasing productivity, to providing safer solutions and reliable results, 3M is a global leader in the rail market. With application engineers available across the globe to serve as a dependable resource, 3M not only provides high-quality and long-lasting products, but also a support system unmatched by any other. These experts are on-hand to provide answers whenever questions arise, allowing 3M to solve unique challenges and demonstrate that along with great products comes great support.

**To learn more, visit 3M at the InnoTrans 2018 Expo, Hall 8.2, booth #227, or visit 3M.com/rail.**

3M™ MCS™ Warranty

*When your finished graphics are made entirely with 3M Graphics products, you're covered by the most complete and robust graphics warranty in the business – the 3M™ MCS™ Warranty.*

# Polarteknik

Metro aluminium E20 Fire partition wall with automatic door, chrome finish

VHST Honeycomb partition walls with automatic door <130 kg

HST Aluminium partition walls with automatic and manual doors

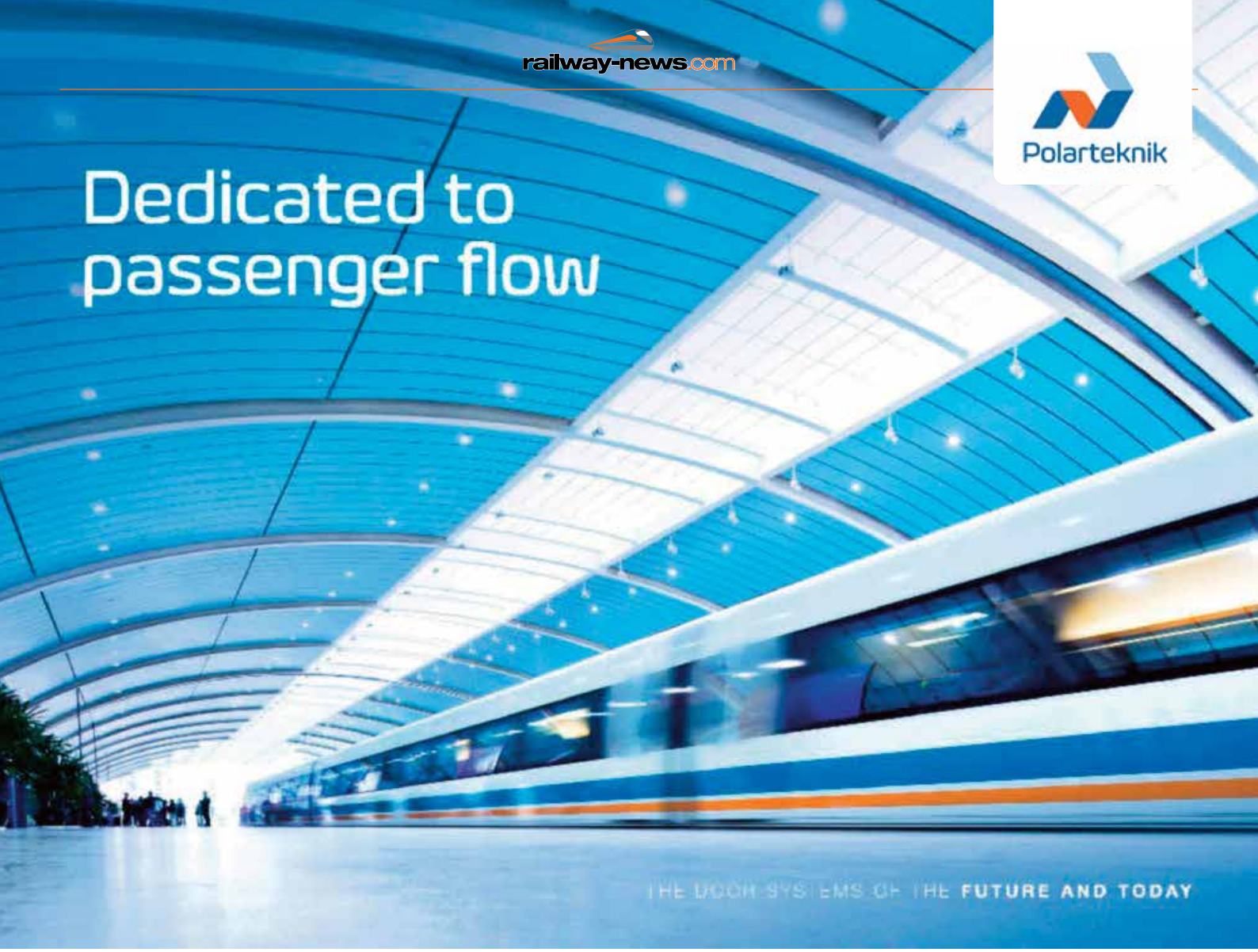
EMU HS Aluminium and glass partition wall with automatic door, 4 country homologations

Full glass 1st Class partition wall with automatic door

Aluminium E15 Fire gangway partition wall with manual door

**Dedicated to passenger flow**

www.polarteknik.fi




# Polarteknik Door Systems

## Our product range includes:

- **complete fire barrier walls**
- **automatic single or double leaf sliding doors**
- **telescopic doors**
- **curved doors**
- **manual doors**
- **hinged doors**

All our products are tailored to our customers' specific needs. The service portfolio includes the design, installation and commissioning support, maintenance, modernisation, spare parts and technical support during the lifetime of the fleet.

**Polarteknik**, a company well known for its expertise in interior door systems in intercity and high-speed and very high-speed classes of rolling stock is strengthening its position in metros and trams with the introduction of new partition wall products to increase driver comfort and safety.

*"We are happy to tie up at all tier levels to make sure the latest technology from new trains – e.g. predictive maintenance and TSI-PRM – is available for refurbishment, overhaul and fleet upgrades."*

**Polarteknik** has a very large number of different products that the company has made for

customer projects. All of the key components have a strong return on experience and are shared across all product platforms. Polarteknik is in full control of the design, testing and validation of the products and customers benefit from the consolidated sourcing made regarding key components and from obsolescence management that draws from the legacy design data.

*"We have over the years experienced the challenges of high-mix/low-volume production and made some considerable investments in production and in-sourced some of the key activities that help us reach our customers' OTD requirements,"* said Tomi Ojala, Managing Director.

Based on a recent customer survey performed in June 2018 Polarteknik is a well-known company in its field. Altogether 96 % of the respondents stated that they knew Polarteknik. In respondents' open comments Polarteknik was seen as a professional and reliable company, commended for its customer focus, with good quality products, expertise and an efficient way of operating.

Although supply chain performance is important, where Polarteknik really excels in is innovation. We are constantly looking for ways to make the products perform better and provide additional value to different stakeholders.

We are looking into new materials and components and developing a new control unit to facilitate predictive maintenance and IoT needs even better. *"We have had data collection for years in new fleets but now we want to provide the same value to older fleets by offering a system that can be retrofitted into older doors as an upgrade or overhaul. We have more than 50,000 Polarteknik-built doors out there that could benefit from an upgrade,"* said Mika Korhonen, Business Development Director.

Polarteknik is involved in all of the benchmark new build projects in Europe such as ICE4, IEP, Italo Evo, Smile and Regiolis with a strong view for the future and will strengthen its focus on service, renovation and overhaul to help keep older fleets on lease with new technology.

Please have a look at page 129 for some additional products made by Polarteknik.

## Polarteknik is preparing for its 10th InnoTrans exhibition in September 2018.

Polarteknik, a company well known for its capability for innovation, tailoring customer oriented solutions and dedication to quality presents its latest innovations at InnoTrans, the largest trade fair for the railway industry, which will take place in Berlin 18–21 September. In 2018 Polarteknik celebrates 20 years of door system deliveries and its 10th appearance at InnoTrans.

With many high-profile projects now in productions such as ICE4, IEP, Transpennine and Smile awarded to Polarteknik the company stands confidently in a great position to make improvements in production to remain competitive and to invest in innovation to be able to offer great new products for customers. This year at InnoTrans Polarteknik will launch an unprecedented number of new products.

Discover Polarteknik innovations and meet with our staff at

**InnoTrans**

**Hall 3.1 Stand 412**

# BAULTAR ADVANCED FLOORING SYSTEM

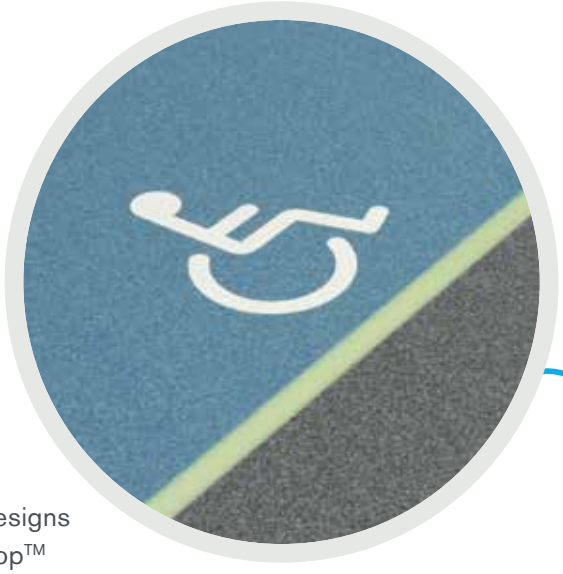
**Hall 5.1 – Stand 215**

## HEATING

Abrastop™ Foam Heating Floors provide superior thermal comfort, energy efficiency, reduced installation time, and lower life-cycle costs – all in one product. Abrastop™ Foam Heating Floors are complete unitized systems that combine Baultar's highly wear-resistant floor covering with a lightweight heating structural subfloor. The heating element, perfectly integrated between the floor covering and the subfloor, is a thin, additional layer that completely covers the panel surface. This high-quality system has been specially designed for mass transit and combines all of the benefits of floor heating systems with the advantages and superior durability of Baultar's flooring solutions.

## LOGOS

Through their highly configurable flooring solutions, Baultar offers clients the possibility of integrating reduced mobility logos, bicycle logos, indication pictograms, and other designs into their chosen Abrastop™ flooring option.




## PHOTOLUMINESCENT BANDS

Baultar's high-performance photoluminescent lighting (HPPL) markers help to indicate walkways, stairs, doors, and other items by absorbing ambient light and quickly transforming it into an intense yellow-green glow that remains visible for more than 90 minutes and facilitates the evacuation of passengers.

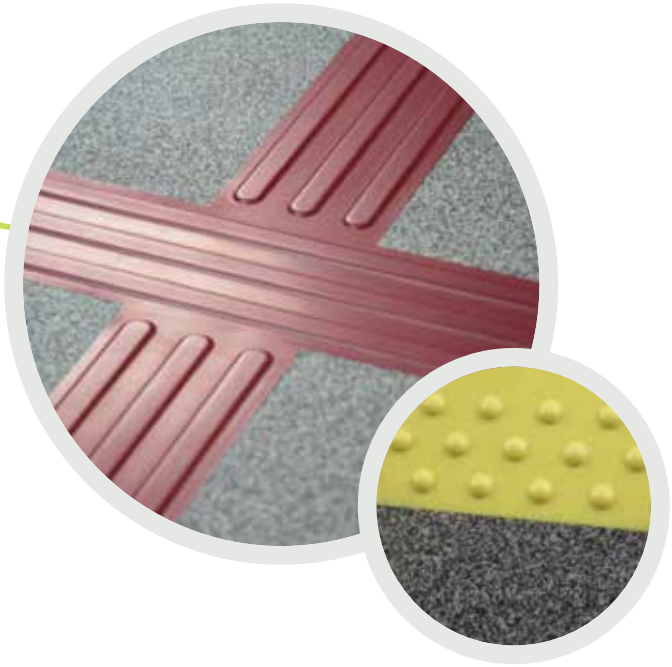
*Baultar Durable Solutions is a Canadian company that designs innovative products for the transportation industry (railway freight, railway public transit, buses, infrastructure). Baultar's flooring division offers an advanced flooring system called Abrastop™. Abrastop™ is a composite structural flooring system that includes (in its most complete version) a floor covering, an integrated sub-floor, and reinforcing layers that combine the best features of each of these elements. The superb durability of this product helps clients to reduce the life-cycle costs of their flooring, and the product's light weight enables clients to generate energy savings.*

## AddGRIP SURFACES

To increase adherence, various types of AddGRIP surfaces and/or bands with different designs and shapes can be included in Baultar's advanced flooring system.

## INSERTS

Baultar offers several different types of inserts that can be added to their flooring system when the flooring is being adapted to meet a client's particular requirements. These include trap doors (by adding handles and trims), seat supports, and tailor-made mechanical fasteners.

## 3D BANDS AND SURFACES

Baultar also offers 3D surfaces, which are commonly used for guidance and can indicate the presence of potential dangers or improve adherence.

# ADVANCED FLOORING SYSTEM

## HIGH PERFORMANCE

Resistant
FST compliant
Lightweight
Durable
Reduced LCC

## ALL-IN-ONE

Covering
Subfloor
Logos
Heating
LLEPM
Options

## EXPERT SERVICE

On-site support
Integration
Engineering
Project management

## CUSTOMIZED

Size
Thickness
Shape
Properties
Cut-to-fit


**BAULTAR**
Hall 5.1 – Stand 215

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Windsor, QC J1S 0A4
CANADA

*+1 819 845 7110*
*marketing@baultar.com*
*www.baultar.com*

# SENSIT s.r.o. – Czech producer of Sensors for Railway Vehicles

We have been producing temperature, humidity, $CO_2$, atmospheric pressure, VOC, level, flow and position sensors since 1991.

**www.railwayvehicles.com**

## Comprehensive line of Interior Sensors for Railway Vehicles

With growing requirements on quality of interior air in the area of home-building, this trend is shifting to the means of transport, as well. Therefore, railway vehicles are no exception. Based on requirements from this segment, we have developed a complete range of interior sensors for **measurement of temperature, concentration of $CO_2$, relative humidity of air, atmospheric pressure and concentration of VOC (volatile organic compounds)**. The values detected are used for monitoring and efficient controlling of the quality of air and environment in passenger compartments of trains, trams, buses, trolleybuses and other means of public transportation.

All these interior sensors meet requirements of the railway standards: **EN 61373, EN 50121-3-2, EN 50155, EN 45545-2 and NFPA 130**.


## The following versions of interior sensors are designed for measurement of individual variables

**Temperature** reading is ensured by the interior sensor series:

- **KS 100** – resistance output
- **KS 500** – 4 to 20 mA output
- **KS 700** – 0 to 10 V output

**Temperature and relative humidity** reading is ensured by the interior sensor series:

- **KSTH 102** – RS 485 output
- **KSTH 104** – CANopen output

**Temperature, relative humidity and CO2 concentration** reading is ensured by the combined sensor series:

- **KSTHC 102** – RS 485 output
- **KSTHC 104** – CANopen output

**Temperature, relative humidity, atmospheric pressure and VOC concentration** reading is ensured by the combined sensor series:

- **KSTHPV 102** – RS 485 output
- **KSTHPV 104** – CANopen output

**Temperature, relative humidity, atmospheric pressure and CO2 and VOC concentration reading** is ensured by the combined sensor series:

- **KSTHCPV 102** – RS 485 output
- **KSTHCPV 104** – CANopen output

| temperature | humidity | $CO_2$ | atm. pressure | VOC |
|---|---|---|---|---|
| RTD / 4 to 20 mA<br>0 to 10 V | RS 485<br>CANopen | RS 485<br>CANopen | RS 485<br>CANopen | RS 485<br>CANopen |

With the use of the **Temperature sensors, Combined temperature and relative humidity sensors, Combined temperature, relative humidity and CO2 sensors, Combined temperature, relative humidity, atmospheric pressure and VOC sensors** and **Combined temperature, relative humidity, CO2, atmospheric pressure and VOC sensors** we secure e.g.:

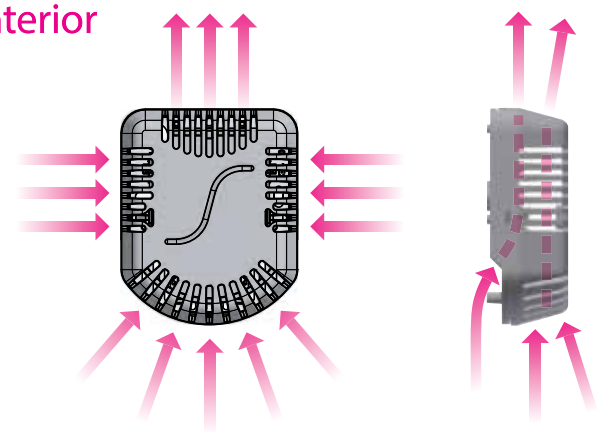
- Creation and preservation of comfortable climate for passengers in railway vehicles
- Establishing and maintaining high quality of air
- Removal of mists of windows and wall of train units
- Energy savings based on evaluation of measured values by the air conditioning unit
- Higher control system efficiency
- Costs savings

## The sensors meet requirements of railway standards and type tests are carried out by the notified body:

- Shock and Vibration test in accordance with **EN 61373**
- Insulation test in accordance with **EN 50155**
- Electromagnetic compatibility in accordance with **EN 50121-3-2**
- the plastic box and PCB materials meet a set of requirements for the R24 materials in according to the table 5 for the fire hazard level HL1-HL2-HL3 of **EN 45545-2**
- Fire protection and life safety in accordance with **NFPA 130**

## The design of the comprehensive line of interior sensors for railway vehicles ensures:

- temperature, relative humidity, CO2, atmospheric pressure and VOC measurement in small aesthetic design
- better air flow around the temperature and humidity sensing element
- significantly faster time response of temperature and relative humidity
- convenient installation and removal of sensor



InnoTrans

We will be glad to provide you with more information on these Interior Sensors for Railway Vehicles as well as on both special and standard temperature sensors designed for this segment at the INNOTRANS 2018 trade fair in Berlin.

**You can find as in Hall 6.2, Stand 105.** **www.railwayvehicles.com**


SENSIT
temperature
humidity
$CO_2$
atm. pressure
VOC
EN 61373
EN 50121-3-2
EN 50155
EN 45545-2
NFPA 130
www.railwayvehicles.com
InnoTrans
InnoTrans 2018
18–21 SEPTEMBER
BERLIN
Come to visit us at
hall 6.2, stand 105
We are looking forward to see you there.
SENSIT team

## RAILWAYLINE

# Reliable in Harsh Environments

Stäubli Electrical Connectors (formerly Multi-Contact) is specialized in providing electrical connectors that meet the demands of harsh environment. We are offering innovative product solutions for increasing your productivity.

**Modular Power Connector MPC**

The compact and modular system has been designed to carry out the connections between several functions of the electrical chain of traction as well as the power connection between the cars.

**The Modular CombiTac System**

CombiTac allows customized combinations of different contact types for countless applications. The new rackable version CT-HE is particularly suited for slide-in systems and fulfills the railway standards for operating temperature, shock, vibration and fire protection.

InnoTrans

**Visit us:**
Innotrans Berlin | 18. – 21.09.18
**Hall 12 , Stand 208**

**www.staubli.com/electrical**

Multi-Contact MC

STÄUBLI

# Powering in Safety and Comfort through the Scenic Swiss Countryside

## Stadler Rail AG, headquartered in the Swiss town of Bussnang, has more than 7,600 employees at more than 30 locations around the world, providing reliable, dependable multi-unit trains, light rail and locomotives customised to suit customer needs.

More than 6,000 Stadler rail vehicles bring state-of-the-art technology to the rails worldwide, allowing millions of passengers to travel safely and comfortably. The low-floor design of the new trains for the Appenzell Railway offer new comfort to all passengers, which is important to Appenzell Railway, just as it is to Stadler with its rail vehicles. Making use of its innovation, passion and flexibility as well as its knowledge of the respective local conditions, Stadler puts the best-possible vehicle on the rails for its customers. This is where the aspirations meet those of Stäubli Electrical Connectors.

### The Business Needs

In railway operations, maintenance must be completed as quickly as possible to minimise rolling stock downtime. Therefore, pluggable connections are ideal for efficient maintenance. Durability and low-loss energy transmission for high currents, maximum shock, impact and vibration resistance and highest robustness – even in extreme climatic conditions – are required for all components in railway technology.

### The Challenge

For Appenzell Railway the connectors used by Stadler must transmit the required power over the acceleration sections after the halts and the tailor-made cable assemblies have to withstand even tight curves and steep hills.

### The Solution

Following their discussions with Stäubli Electrical Connectors, Stadler decided the time had come to compare the existing screwed connections between the carbody and the bogie with the compact and space-saving MPCs with its excellent power transmission characteristics. Stäubli was able to prove that the MPC could meet the high expectations by means of targeted test procedures, which were tailored to the specific requirements of Stadler and the Appenzell Railway. Therefore, the route and elevation profile of the track in Appenzell were taken into account in the design and testing of the connection solution including the customised cable assembly.

### The Added-Value Provided

The expert advice, the excellent supply availability and, above all, the close collaboration during the installation and construction phases of the new connectors for Stadler in the Appenzell trains were convincing. “The electrical tests carried out specifically for the Appenzell Railway project prove the outstanding suitability under the required conditions.

This ensures that we can offer our customers the safety and operational warranty they need. The MPC allows for speedy handling and contact reliability during maintenance periods, which brings the entire train back into operation and back on the rails faster," concluded Stadler.

The increasing global demand for public transportation solutions in urban areas can be seen in Stadler Rail's workshops. Modern, comfortable, safe and efficient rail vehicle technology is developed and customised here. In addition to the five new train compositions for the Appenzell Railway, further trains in various designs are available for other customers in the assembly halls. Stäubli's MPC solutions will also be integrated here to ensure a maintenance-friendly and secure traction interface.

*Narrow-gauge trains by Stadler Rail*

**Market Segment:**
**Industrial Connectors:**
Modular Power Connector MPC
**Application:**
connections between various applications of the traction chain

- **Modular, universal, compact**
- **Low-loss energy transmission for high currents**
- **Resistant to impact and vibration**

## Customer advantages

- **Reliable, pluggable connection to reduce down-time during maintenance**
- **Tailor-made cable assembly for easy but safe installation**
- **Customized testing as proof**

## About Stäubli Electrical Connectors

Stäubli is a recognized specialist for advanced contact technology and sophisticated solutions with a product portfolio ranging from miniature connectors up to high-power connectors for power transmission, test and measurement, transportation and many other industries. In Photovoltaics, Stäubli is global market leader with its MC4 connector components. The core of all Stäubli electrical connectors is the unique MULTILAM contact technology.

**www.staubli.com/electrical**

## Visit us:

**InnoTrans Berlin**
18–21 September 2018
**Stand 208** / **Hall 12**

STÄUBLI

**Multi-Contact** MC

*Compact Stäubli MPC assembled with cables*

# Using wireless condition monitoring in the rail sector

## Replacing traditional maintenance regimes with condition monitoring will help rail operators to reduce the time they spend servicing their rolling stock, write SKF's Nils Ekholm and Mark Rhodes*.

The rail industry's prevailing maintenance regime is to service trains on a time or mileage basis. Though it has been used successfully for many years, it does not take account of whether parts actually need replacing. Nor is it effective at preventing breakdowns.

Condition-based monitoring (CBM), which measures parameters such as vibration and temperature to spot anomalies at an early stage, has been commonly applied for a long time in many industries. However, the railway sector has been slow to adopt it – due in part to a number of safety regulations that govern it but also because suitable technology has not been available. Recently, though, a number of other industry drivers have come to the fore that could see CBM being adopted more widely in the rail sector.

The main factor is efficiency. Rail schedules are crowded, and tracks are more congested. Rail operators are under pressure to work as efficiently as possible, and keep their rolling stock in good working order. Trains need to be out on the track – ferrying passengers around – rather than spending long periods of time in maintenance depots being serviced.

But if maintenance is a drag on resources, disruptions caused by breakdowns are even worse. So in addition to cutting maintenance times, rail operators must minimise the breakdowns that cause so much misery for commuters.

CBM can help achieve this in two main ways: it identifies problems early, which reduces the risk of breakdowns; and, it can reveal when 'old' parts are perfectly healthy – which, in turn, helps to extend maintenance intervals and keep them out of the depot for as long as possible. The technology is well proven within the manufacturing sector, and companies such as SKF have applied it to the rail industry with a high level of success.

## Wheel insight

SKF has actually gone a step further by developing a wireless CBM system – called SKF Insight – that can be used on trains. It consists of retrofitting a small sensor on to the wheelset axlebox assembly of the train, to detect bearing damage.

The sensor picks up tiny inconsistencies in the vibration of a bearing as it begins to fail – despite it being in an environment wracked by noise and other

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The sensor picks up tiny inconsistencies in the vibration of a bearing as it begins to fail – despite it being in an environment wracked by noise and other

vibrations. Sophisticated signal processing and algorithms separate the signal from the noise, ensuring that each sensor produces accurate data for further analysis.

Each of the wireless sensor nodes has an array of different sensors included and is capable of taking several different measurements pertaining to bearing health including SKF Acceleration Enveloping (gE), and temperature. The sensor node is equipped with GPS for location and speed; three axis accelerometer; movement sensor; temperature sensor; high sensitivity and high-frequency vibration sensor; and a real time clock. Each sensor node can be remotely configured to meet individual customers' specific monitoring needs and operating schedule. An integrated battery avoids the need for external cabling and offers a reliable, predictable, long lasting source of power.

SKF Acceleration Enveloping (gE) is a long-established vibration measurement which is proven to give early indications of bearing damage. A standard acceleration vibration measurement is band-pass filtered, rectified and finally enveloped. Advanced processing and trending of the resulting signal is then performed using the software SKF @ptitude Observer. Using this measurement it is possible not just to detect the presence of damage but also to determine what bearing component is damaged (i.e. rollers, cage, outer raceway, inner raceway). For vibration activity to be classed as symptomatic of bearing damage periodic activity must be consistently present in the data at sufficient magnitude and at very specific frequencies.

Temperature measurements typically give a significantly later

indication of bearing damage than gE with sudden and sustained increases in temperature indicative of a possible imminent failure. The inclusion of the temperature data is intended as complementary to the vibration data (gE) which forms the core of this analysis.

The whole system uses wireless reporting. The sensor's data is sent to a remote diagnostics centre, using mobile data. There is no need to fit a cumbersome on-board router, and all the cables have been removed.

Having been used in the proof of concept system, the sensor technology itself is well proven. It can be installed in a few minutes, by fitting on one of the bolts that screws the axlebox cover into place.

As well as detecting bearing health, the system also monitors wheel flats. These are usually caused during braking and – if left unchecked – they can damage the track. Ordinarily, wheel flats are monitored using track-side detectors, but SKF Insight can also perform this vital operation.

## Number crunching

Collecting and sending the data is one thing – but acting on it is something else. Rail operators do not want to plough through mountains of data to interpret it. Instead, they want clear recommendations for action. So, once the data has been processed and analysed it is used to produce a simple report.

An automatic alarm will trigger whether action is needed. SKF experts then check the output and produce a report – such as recommending a planned replacement of the bearing.

SKF has worked to reduce the amount of data given to the customer – and the number of false alarms. As well as bearing data, the system analyses information on temperature – as well as speed and positional data using GPS. All the generated data is stored in the SKF Cloud.

The system is moving out of the development phase, following a successful field trial: in 2015 the system was fitted to a railway vehicle owned by the Swedish national railway operator, SJ, and accurately diagnosed three damaged bearings. In 2017 it went through validation as it was fitted to more trains in the field, and was fully launched afterwards.

**** Nils Ekholm is a Technical Leader for the new market offer at SKF, while Mark Rhodes is a Technical Leader for the development project at the company.***

WELDYX

GLUETEC GROUP






# WELDYX MASTER

## 2C HIGH PERFORMANCE ADHESIVE

WELDYX MASTER CERTIFIED QUALITY DIN EN 45545-2/R1

## VEHICLE CONSTRUCTION, PRODUCTION, REPAIRING.

- Fire protection HAZARD LEVEL HL 3 for WELDYX MASTER 5 & WELDYX MASTER 15
- For structural, semi-flexible and highly resistant bonds of metals, composites and plastics
- Reduced shrinkage
- Extremely high gap filling capacity (0.25 to 25 mm)
- Above average elongation properties (about 100 %)
- High final strengths even without pretreatment
- Usage without primer saves time


GLUETEC Industrieklebstoffe GmbH & Co. KG · Am Biotop 8a · 97259 Greußenheim · GERMANY
Tel.: +49 (0) 93 69 / 98 36 0 · Fax: +49 (0) 93 69 / 98 36 10 · info@gluetec.de · www.gluetec-group.com

# WELDYX MASTER – High-Performance Adhesive in Certified Quality

## GLUETEC GROUP presents the latest generation of structural adhesives at INNOTRANS 2018 in Berlin

GLUETEC will be exhibiting at InnoTrans 2018 in Hall 8.1 / Booth 115 together with its Czech partner SPT Sourcing Point Technology under the motto 'Maximum safety – high-performance adhesives in certified quality'. The latest generation of GLUETEC high-performance structural adhesives will be presented exclusively at InnoTrans.

Structural adhesives offer many advantages in vehicle construction as well as in maintenance and repair. Due to the wide selection of curing speeds, they are particularly well suited for various modular assembly techniques. Compared to drilling or welding, elastically bonded structures withstand shocks and vibrations much better. In addition, there is no damage to the substrates themselves or their structure. This is true when it comes to the interior design of rail vehicles for example: the chassis no longer has to be pierced in order to mechanically attach floor panels or something similar, interior noise and vibration levels are reduced to a minimum and corrosion is avoided. Thanks to testing in line with EN 45545-2 / R1 and the fulfilment of fire protection HAZARD LEVEL HL 3 all GLUETEC adhesives shown meet the specifications for rail vehicles with a high hazard class. Thus, structural adhesives can contribute to both more comfort and safety in rail traffic.

GLUETEC GROUP

### WELDYX MASTER

The new product WELDYX MASTER was developed together with customers and with the requirements of railway applications in mind. It is compatible with all common substrates used in the railway industry. WELDYX MASTER makes structural, high-strength and at the same time flexible and highly resistant bonds possible. The 2-component methyl methacrylate adhesive in a mixing ratio of 10:1 is available in processing times of 5 and 15 minutes.

WELDYX MASTER is a high-performance adhesive developed for the structural bonding of metals, composites and plastics. Due to its uncompromising quality, it is perfect for the demands of extensive industrial applications. Aluminium and stainless steel can be bonded without the use of a primer, which saves time. Due to its flexibility, materials with different thermal expansion coefficients can also be glued structurally. Compared to its predecessor, WELDYX professional, WELDYX MASTER scores with even lower shrinkage behaviour and a slightly longer reaction time, which allows the user precise gluing in a longer time window. These properties were also confirmed by a product analysis performed by the Fraunhofer Institute LBF.


## Applications:

- **Structural bonding**
- **Vehicle construction, railway supply industry, railed vehicles, repairing**
- **Bonding of materials with different thermal expansion coefficients**
- **Interior bonding and sealing**
- **Fire resistance application**
- **Floor bonding**
- **Bonding and sealing of external vehicle components**


## Features at a glance:

- **Fire protection HAZARD LEVEL HL 3**
- **High-performance adhesive for structural, semi-flexible and highly resistant bonds**
- **Especially suitable for metal, composites and plastics**
- **Reduced shrinkage compared to WELDYX professional**
- **Extremely high gap-filling capacity (0.25 to 25 mm)**
- **Above average elongation properties (about 100%)**
- **High final strengths even without pre-treatment**
- **Processing times: available in 5 and 15 minutes**
- **Fixing time: available in 15 and 45 minutes**
- **Colour: black**
- **Tensile shear strength: 12–15 N / mm² (on PMMA)**
- **Shore Hardness: 65 D**
- **Available in 50 ml, 250 ml, 490 ml cartridges**

## WELDYX professional

WELDYX professional is a proven high-performance adhesive

designed for the structural bonding of metals, composites and plastics, providing strong, flexible and highly durable bonds. In addition to the fire protection approval HAZARD LEVEL HL 3, WELDYX professional has also obtained its ISEGA clearance certification meaning it can be safely used to bond components made of plastics and metals which are used in food-related areas. The components made with the adhesive may be in direct contact with food, as far as the adhesive is concerned, as long as it has cured sufficiently.

## Features at a glance:

- **Fire protection HAZARD LEVEL HL 3**
- **ISEGA – statement of confidence**
- **Excellent stretch properties when joining a wide variety of materials**
- **Bonding of aluminum and stainless steel possible without primer**
- **Significantly reduced shrinkage behaviour in the curing process**
- **In most cases no post-processing is required**
- **Short temperature loads up to +230°C possible, e.g. for painting or electroplating processes**
- **Processing time WELDYX professional 5: 4–6 minutes**
- **Processing time WELDYX professional 15: 15–20 minutes**
- **Max. tensile strength: 100–125%**
- **Tensile shear strength (N / mm2): <24**
- **Operating temperature range: -40°C to + 125°C**

# WIKO MS POLYMER 2K BOOSTER

WIKO MS POLYMER products can be used universally in industrial and manual vehicle / body construction as well as in the marine sector. They can also be used in ventilation, air-conditioning and electrical engineering, in apparatus construction and in metal / sheet metal processing as well as in many areas of plastics technology. WIKO MS POLYMER 2K BOOSTER is wet-over-paintable and UV-resistant. The odourless property makes it more pleasant to work with and the low volume shrinkage achieves optimal results in the application. The B component contained in the WIKO MS POLYMER 2K BOOSTER, when mixed, adds the moisture necessary for cross-linking. This guarantees process-reliable and accelerated networking.

## Features at a glance:

- **Fire protection HAZARD LEVEL HL 3**
- **Accelerated construction adhesive**
- **Elastic and moisture-curing**
- **Suitable for indoor and outdoor use**
- **Free from solvents**
- **UV-stable**
- **Elastic bonding of strips, profiles, sheets etc.**
- **Sealing of seams, overlaps, joints and cracks**
- **Fast sealing directly in front of paint finishes**
- **No lacquer tear as well as no sinking of the lacquer over the sealing seam**
- **Available in the colours: white, grey, black**
- **Suitable for: industrial and manual vehicle / body construction, marine, ventilation and air-conditioning, electrical engineering and apparatus engineering, metal and sheet metal processing, plastics technology and assembly**
- **Mixing ratio: 10:1**
- **Available in: 490 ml double cartridge**

# WINTERIZED RAILWAY


# SMART SWITCH POINT HEATING

***SwitchPoint Heating AB delivers complete custom length heating kits for rapid installation with plug connected elements and control cabinets with integrated dig down ground stand all parts are compatible with other common heating systems***

4-Way connector with sockets and molded in cables IP68
Quick connect plugs IP68

Fast installation with stainless steel protective channels and knock on clips in stainless spring steel with barbs

Flexible custom length elements with plugs IP68

Control panels with software controlled triac and remote control by the internet built in polyester enclosure with dig down ground stand

**For more information and quotations contact Thomas Thorin**

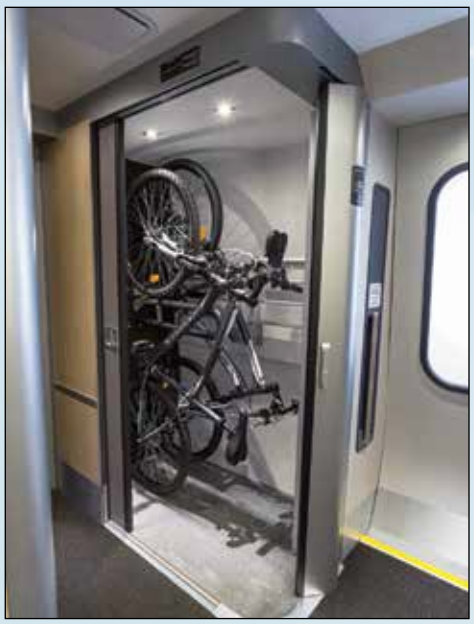
**Phone +46 (0)703- 30 30 35 thomas.thorin@thorin.se**

# Foundation for Safety

## UK: Hitachi

Treadmaster have been working as a key supplier to Hitachi Rail since the first IEP Class 800/801 trains were commissioned back in 2014. The new intercity trains are now nearing passenger service, as part of the £5.7bn investment to modernise journeys along the East Coast and Great Western main lines. As part of the manufacturing process, there has been a strong focus on a high-quality UK-based supply chain offering bespoke solutions.

Hitachi's engineers were looking for a flooring product that could provide a dual solution in the passenger cars. Firstly to support the primary floor covering of carpet and help it to achieve the more stringent fire standard of BS6853 Cat1b (as well as EN 45545-2, see 'Hot Topic' below – ed.) and secondly to provide a water-resistant barrier between the carpet and the subfloor to protect the subfloor from liquid ingress and potential costly maintenance.



The InterCity Express project (IEP) also presented a range of challenges for the interior design team at DCA, especially in the key areas of toilets and driving cabs. As with all new train designs there is the difficult task of selecting materials that have the right mix of visual integrity, longevity in service and technical performance.

From a design perspective it is important to select materials that offer the right balance of physical attributes, i.e. that are easy to clean, hard-wearing, and have slip-resistant surfaces with a premium look and feel to give the right visual impression.

All too often materials can be selected on either price (to meet low budget requirements) or purely physical performance (fire resistance and abrasion properties). In isolation these features meet the technical specification but do not create that special quality that the best designs can achieve.

Using existing technologies Treadmaster developed a bespoke product that could be used as a water barrier while meeting the fire requirements of BS6853 Cat1b. The product is 1.5mm, half the thickness of their standard rail flooring products.

In the case of the IEP toilets and cab design a Treadmaster technical flooring TM8 was selected to provide the right combination of design flexibility and to outperform the technical requirements. The ability to select colours that integrate with the interior schedule of finishes was a big bonus as it allowed us to customise the designs instead of using standard catalogue colours and finishes.

Treadmaster have a proven pedigree in providing the highest fire-retardant flooring for the rail sector and particularly for underground rolling stock. They are the current flooring supplier to London Underground and are working on a number of projects for TfL including the new Elizabeth Line trains.

Treadmaster's Business Development Manager says that *"although we specialise in metro and commuter rail applications the Class 800/801 programme demonstrates that we have the flexibility and engineering capability to work on bespoke products for our customers.*

*"We can offer solutions for all types of rolling stock and although fire safety is a higher priority when considering which flooring to specify on rolling stock, other attributes such as wear and slip resistance, design aesthetics, cleanability and maintainability are also key factors."*

Treadmaster are continuing to support Hitachi on their other contracts including Class 385 trains for Abellio ScotRail and the West of England Class 800/801 rolling stock programmes for GWR.

## Malaysia: KVMRT

The Klang Valley Mass Rapid Transit (KVMRT) System is one of the most important and largest transport infrastructure projects Malaysia has embarked on. This project will provide a major boost in the integration and efficiency of urban public transport.

In October 2012, the consortium SSSC (Siemens Malaysia, Siemens AG and SMH Rail) was awarded the contract to supply 58 new driverless four-car metro trains. The trains are capable of carrying up to 1,554 passengers (at 8 persons/m2), with up to 174 seats and standing room for up to 1,380 passengers. The train is designed for operation in tunnels and on elevated tracks.

The vehicles are part of the Inspiro family. The car bodies for the trains were produced by CSR Puzhen in China. The final assembly of the vehicles was performed in Malaysia by the consortium partner SMH Rail. Designworks, a BMW Group Company, developed the interior and exterior design of the trains. The "guiding light" design concept was inspired by the architectural characteristics of modern Malaysia and reflects the dynamism, elegance, and technological progress of Kuala Lumpur.

For the flooring interior design Treadmaster Flooring and Designworks USA joined forces. Together the partners developed a holistic interior that combines future thinking, customised processes and in-depth expertise in the rail industry.

*"Treadmaster was a valuable partner to create a solution that stayed true to the initial design intent,"* says Elke Weisbarth, Colour and Material Designer at BMW Group Designworks USA. *"With a high degree of design understanding, profound knowledge on how to move things in bigger structures and with innovative solutions for solid coloured floor coverings that fulfil the highest demands in the market Treadmaster helped us to get implemented the holistic design approach from the big picture to small details. The result is a comfortable interior perception of wellbeing."*

Treadmaster supplied two grey colours of its highest fire-retardant flooring product TM7 so that the trains meet the high fire-protection requirements according to BS 6853 Cat. 1a

## HOT TOPIC

In rail, fire standards are much more stringent than for land-based buildings but the fundamental principle should always be the same – safety should never be compromised over costs.

As of 2018 the New European Rail Fire standard EN45545-2 is mandatory across Europe and is set to take over from existing national standards such as BS6853. The key focus of this is to harmonise rail fire standards across Europe making it easier for all European companies to have access to the wider European market without having to meet the previous existing non-harmonised national fire standards.

In some quarters the new EN45545-2 standard is acknowledged as being less stringent than the existing national standards and as a consequence, some materials that didn't meet the old national standards may now meet the new European standard.

Specifiers and operators should not feel pressured to reduce costs by using materials that would not have previously met the national standard but now meet the European standard.

Fortunately for specifiers Treadmaster can offer robust rail compliant floor coverings as their TM7 flooring meets the BS6853 Cat 1a and EN45545-2 HL3 and TM8 meets BS69853 Cat1b and EN45545-2 HL3.

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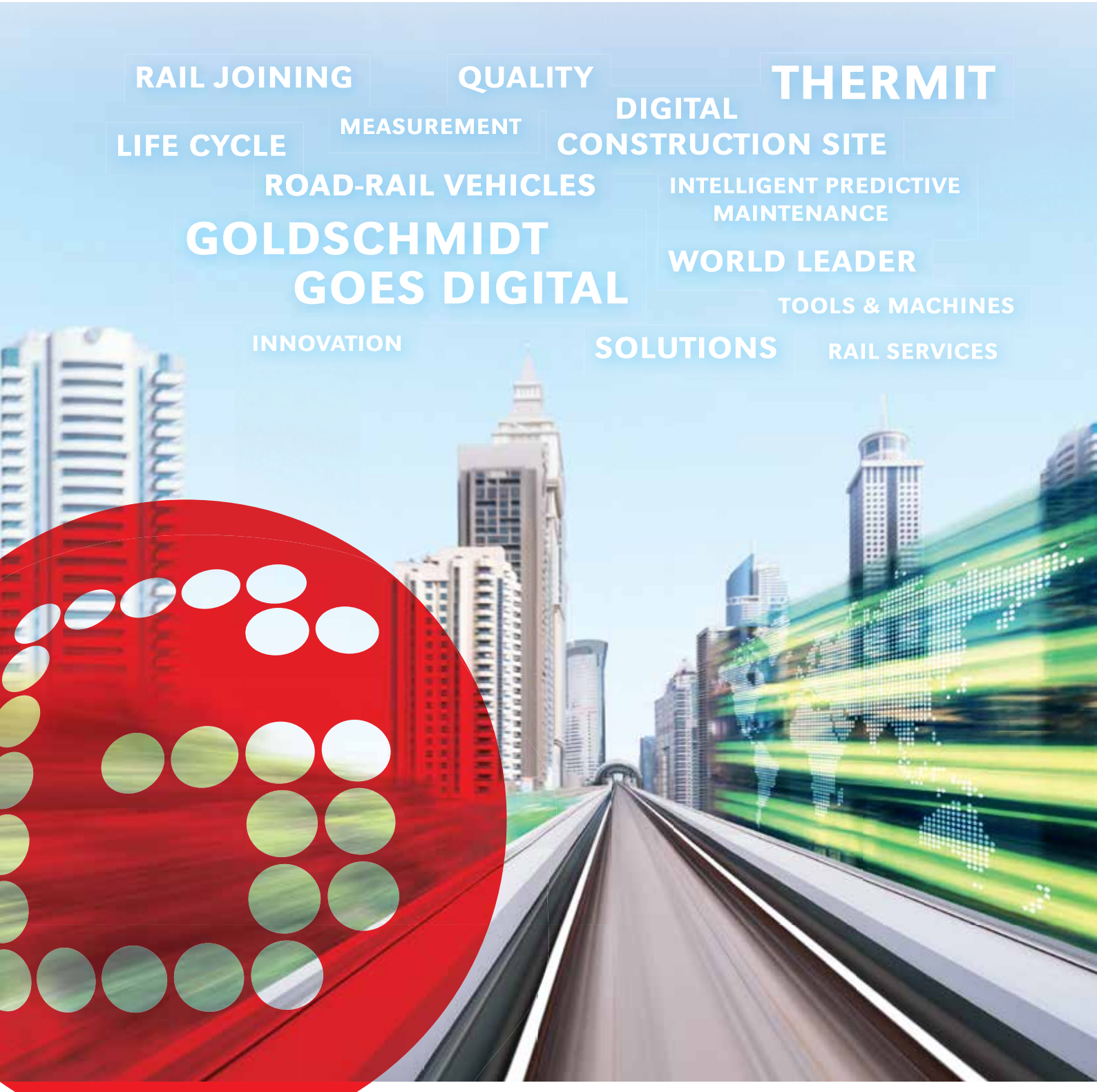


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